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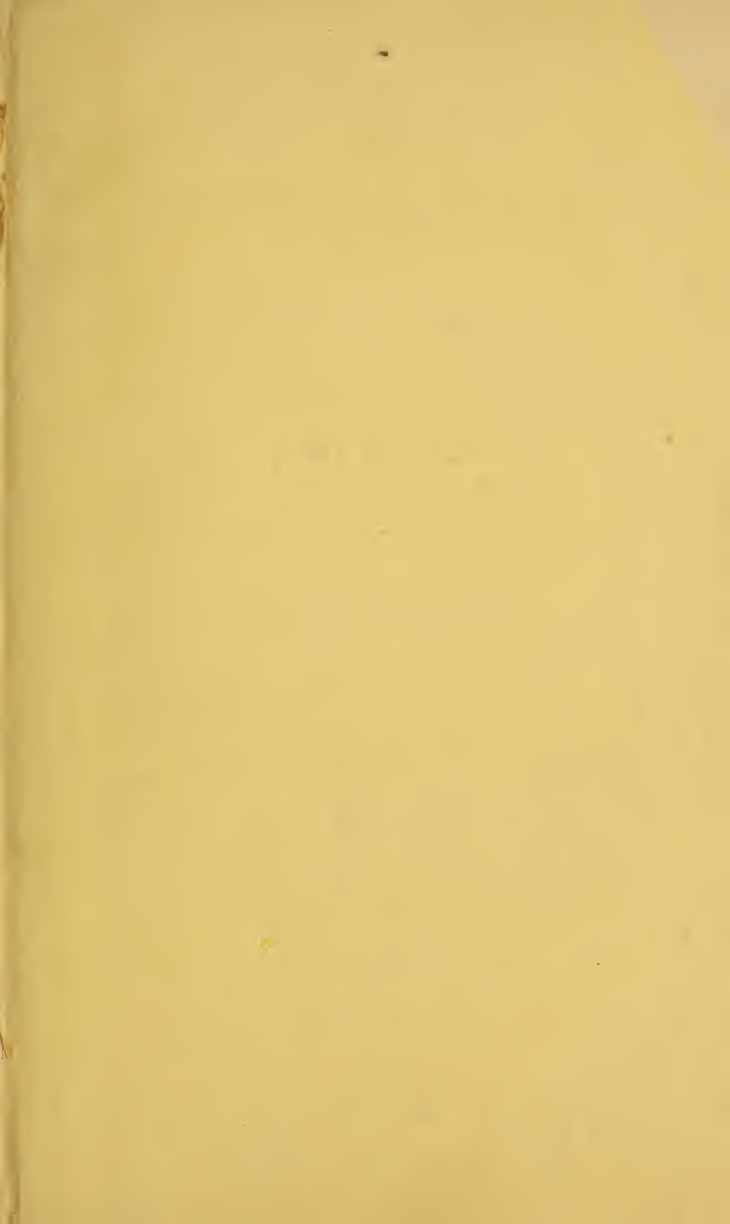
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THE
GARDENER'S
MONTHLY VOLUME.

v. 6

THE PINE APPLE;
ITS CULTURE, USES, AND HISTORY.

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THE PINE APPLE.

HISTORY.

THIS Queen of Fruits is found wild in the tropical latitudes of America, Asia, and Africa. Tradition says that, being native of the first of the above-named of the earth's quarters, it was thence exported to the others; and this tradition is uncontroverted by the earliest of the botanical writers to whom it became known. They appear not to have become acquainted with it until the commencement of the 17th century; for neither Lyte (in 1578) nor Gerard (in 1597) notice the pine apple in their "Herballs," published in those years respectively; but Johnson, in his edition of Gerard, which issued from the press in 1633, figures and describes it as follows:—" *Ananas pineas*, the pinia, or pine thistle, is a plant having leaves like the aizoon aquaticum, or water sengreene. The meat of this fruit is sweet, and very pleasant of taste, yielding good nourishment. There are certain small fibres in the meat, which, though they do not offend the

mouth, yet hurt the gums of such as too frequently feed thereon." The woodcut demonstrates that it is the pine apple to which his observations refer.

Parkinson, in his "Theatrum Botanicum," published in 1640, is much more copious in his description, more accurate in his delineation, and gives much more information concerning its history. He calls it "Anana seu Pina, the West Indian delicious Pine;" and proceeds to state that it was first brought from Santa Cruz, in Brazil, where it grows wild; and was thence introduced to the East and West Indies, being not a native of either. In Brazil, it was called by the natives *nana* and *anana*, but by the Spaniards and Portuguese *pinas*. Parkinson, however, knew little of its properties, speaking of them only by report, and enumerating as among them, that if the blade of a knife be left sticking in one of them, that portion of the blade will next day be found corroded entirely away. It was certainly not then cultivated in this country, for we had then no glazed structures, which we know are necessary for its successful cultivation; and Parkinson does not even mention it in his great gardening book, the "Paradisus," published in 1656.

It was first introduced into England by Mr. Bentick, afterwards Earl of Portsmouth, in 1690, but merely as a plant worthy of being added to our great national botanical collection, and without any sugges-

tion that it might be cultivated as a dessert fruit. (*Hortus Kew.*)

Yet the fruit of the pine apple had been made known in England in 1657; for an embassy returning to this country from China, in that year, appears to have brought pine apples thence as a present to Oliver Cromwell. John Nieuhoff, who was secretary to the embassy, describes the fruit very correctly; and Evelyn, in his "Diary," under the date of 9th August, 1661, says, "I first saw the famous Queen pine brought from Barbadoes, and presented to his Majesty (Charles II.); but the first that were ever seen in England were those sent to Cromwell four years since."*

It may be that from the crowns of this, and of others mentioned by Evelyn as sent to the king from the West Indies, in 1668, that Mr. John Rose, his Majesty's gardener, succeeded in raising a fruit of the pine apple in this country. We say it may be, because there is a portrait, in oil colours, of Rose, at Kensington Palace, representing him giving a pine apple to Charles II. Rose was then gardener to the Duchess of Cleveland, and the garden in which the present is being made was that at her Grace's seat, Downey Court, Buckinghamshire.† We do not know

* Evelyn makes no mention of the pine apple even in the 3rd edition of his "French Gardener," published in 1672.

† There is a copy of this in water colours in the Library of the London Horticultural Society.

whether this is the same, or a duplicate of a similar picture, once in the possession of Earl Waldegrave, and which, Walpole says, was bequeathed by Mr. London, Rose's apprentice, to the Rev. Mr. Pennicott, of Thames Ditton, by whom it was given to himself.

If Rose was sufficiently skilful, or so fortunate, as to ripen a pine apple in England, it became immediately afterwards a lost art, for neither Evelyn, London, Wise, Rea, or Switzer, speak of it as an object of cultivation. Soon after Switzer ceased to publish, in 1732, its cultivation was successfully attempted in Holland. This was by M. Le Cour (or La Court, as written by Collinson), a wealthy Flemish merchant, who had an excellent garden at Drieoech, near Leyden, of which he published an account in 1732, and died in 1737. This garden was visited by Miller and Justice, who speak of its proprietor as one of the greatest encouragers of gardening in his time ; of his having curious walls and hothouses ; and they agree that he was the first person who succeeded in cultivating the pine apple. It was from him, Miller observes, that our gardeners were first supplied, through Sir Matthew Decker. Pine apple plants had been introduced into the Amsterdam gardens long previously, whither some of the plants were brought from the Dutch East India settlements, but more from their colonies at Surinam and Curacoa, in the West Indies. In 1712, the number of pine

plants thus collected amounted to about 200, but, though vigorous, they had not yet been brought to a fruit-bearing state. Mr. Le Cour, says Bradley, who was an eye-witness of these facts, was not discouraged by the ill-success of others. He built various stoves, and adopted different modes of treatment, until he, at length, succeeded in producing and ripening several hundred pines annually ; and the plants (suckers) increased so fast, that the gardener raised Mr. Bradley's wonder by telling him that hundreds were yearly thrown away. Though Mr. Le Cour succeeded in ripening pines, we should not now say anything in commendation of the fruit he produced, since Bradley, speaking of the first, says "they were about four inches long."

In 1718, the culture of the pine apple was for the first time established in England by Mr. H. Telende, gardener to Sir Matthew Decker, at Richmond, in Surrey. In that year Mr. Bradley saw there forty fruiting plants, of which the smallest fruit was four inches and the largest seven inches in length. (*Bradley's Gen. Treatise of Husbandry and Gardening*, i. 209.) He planted the suckers in August; they bloomed in April, and the fruit was ripe in five months from the time of its first appearing. His pits, built of brickwork, required, for heating, 300 bushels of bark, and he employed tepid water in supplying the plants with moisture. Mr. Telende em-

ployed a thermometer, that he might be certain of the temperature he employed; and to this, Mr. Bradley recommends the barometer and hygrometer to be added, as guides for the gardener.

In the Fitzwilliam Museum, at Cambridge, is a landscape, by Netcher, in which a pine apple is introduced, and this is there stated to be the first fruited in England, and that it was produced at Sir Matthew Decker's; but if the picture of Rose, before noticed, is correct, this is not strictly in accordance with facts.

Passing to the other portions of the British Isles, we find that pine apples are said to have been first brought to Dublin by a man of the name of Buller, who, in the reign of Queen Anne (1702—1714), settled in the vicinity of Dublin, and held an extensive nursery in New-street, where traces remain of it to this day.

James Justice, Esq., one of the principal clerks of Session in Scotland, first introduced the pine apple into that portion of the kingdom, cultivating it in his garden, at Crichton, near Dalkeith, but where, it is to be regretted, he shortly wasted his fortune by a lavish expenditure on rare plants. He died in 1762. The cultivation of this fruit was now fully established in this country, and we need do little more than enumerate the various separate treatises that have been published on the subject.

In 1767, John Giles, at one time gardener to Lady Boyd, at Lewisham, in Kent, and afterwards foreman to Messrs Russell, nurserymen in that village, published "Ananas, or a Treatise on the Pine Apple." It is the first really practical work, giving full details of the culture of the plant, that issued from the press. For, as he observes in his preface, the directions given by Miller, Hill, Meader, and others, were too short and imperfect to enable the novice to attain success. He gives the plan of a pinery to be heated by the combined influence of tan and flues.

Only two years after Mr. Giles' work, in 1769, appeared another on the same subject, entitled "A treatise on the Ananas or Pine Apple." The author of this was Mr. Adam Taylor, gardener to J. Sutton, Esq. of New York, near Devizes. He claims for himself the merit of being the first who brought the fruit to an improved size and excellence without the aid of fire heat. A coloured engraving of the pine apple is prefixed to the volume, and, if this be the improved size then attained, its predecessors must have been small indeed, for it is only six pips high. That this was so, we may conclude from the drawing of a pine apple published in 1733, by a gardener, at Kensington, named Furber, and this is only four pips in height. Taylor's pit is glazed throughout, except at the back, and is heated entirely by tanner's bark placed beneath the soil.

W. Bastard Esq. of Kitley, Devon, informed the Royal Society, in 1777, that he grew pine apples in pots, plunged in cisterns of water instead of the bark bed, and that they were much larger and better flavoured in consequence. They, however, required a higher temperature, and to be near the glass in the upper part of the hothouse, for they would not thrive when so plunged in the lower parts of the house. (*Phil. Transac. ab. xiv. 224.*)

In 1779, Mr. Speechley published his "Treatise on the Culture of the Pine Apple," recording in it his experience relative to its culture whilst gardener to the Duke of Portland, at Welbeck, in Nottinghamshire. He combined the culture of the vine with that of the pine apple, and his structures are designed for that purpose. He gives fuller particulars concerning the insect enemies of the pine apple than do any of his predecessors.

In 1806 appeared "A Treatise on the Culture of the Pine Apple," by Mr. W. Griffin, at that time gardener to J. M. Sutton, Esq. of Kelham, in Nottinghamshire, as he was subsequently to S. Smith, Esq. of Wood Hall, Herts. This, we consider, displays, as a whole, more correct knowledge of the pine apple's culture than is given in any of the works previously published. The Queen pine apples which he grew averaged more than 5lbs. in weight, and his New Providences attained to full 9lbs.

In 1818 Mr. T. Baldwin, gardener to the Marquis of Hertford, at Ragley, in Warwickshire, printed "Short Practical Directions for the Culture of the Ananas," but as he asked a guinea for those few pages he sold very few; though of manuscript copies, at a lower price, he disposed of a considerable number. He was considered the best pine grower of his days, but we consider his directions in no particular superior to those by Mr. Griffin.

About the time that Mr. Baldwin wrote, Mr. Andrews, market gardener, of Vauxhall, adopted steam as a mode of heating his pine stoves and pits.

One of the earliest, if not the earliest instance of steam being used as a bottom heat, with which we are acquainted, was that by Mr. Butler, gardener to the Earl of Derby, at Knowlesly, near Liverpool, in or about 1792. It had been used twenty years before, but chiefly for other purposes. Speechly, in 1796, knew only two instances in which steam was applied as bottom heat.

Mr. John Hay, horticultural architect, also tried the use of steam as early as 1794, when gardener at Preston Hall, near Edinburgh, and he says the application of steam to forcing houses early caught his attention. The first that he designed and executed in Scotland on this plan, was at Preston Hall, in Mid-Lothian, in the year 1794. The fruiting pine stove, which is in the general suit of houses, with two peach

houses on the west, was originally adapted to steam. (*Loudon on Pine Apple*, 172.)

In 1822, Mr. Loudon gathered together, in a useful but ill-arranged volume, "The different modes of Cultivating the Pine Apple," and, just previously, the highly correct scientific views of Mr. Knight, then President of the Horticultural Society of London, appeared in its Transactions.

In 1839, Mr. R. Glendinning, then gardener to Lord Rolle, at Bicton, published "Practical Hints on the Culture of the Pine Apple," and though based on good practice yet they also have the merit of combining with this most sound scientific opinions.

In 1844 and 1845, Mr. Hamilton, gardener to F. A. Phillips, Esq. of Thornfield, near Stockport, and Mr. G. Mills, gardener to the Baroness de Rothschild, of Gunnersbury Park, Middlesex, each published a very excellent "Treatise on the Culture of the Pine Apple."

During the whole of the period these several works were being published, various valuable contributions to our knowledge of pine culture also appeared in periodicals of the day: from these and from the works named we have gleaned what we considered original and valuable, assigning as far as possible tribute to whom tribute is due.

In 1820, the pine apple began to be sent to England in abundance from the West Indies, although the

shortest passage was then six weeks. This greatly lessened their price, and rendered them more common. They were sold at fruit-stands in the London streets, in one or two places, during the summer months; and moderate-sized fruit were to be had from half-a-crown to a crown each; or at two shillings a pound.

The first importation to London was of 400 Green Providence pines from the Bermudas, which were purchased by Mr. Mart, fruiterer, in Oxford street.

The annual importation of this fruit from the West Indies, and as it is said from Nassau, in New Providence, has increased to many thousands, and they, during the season, crowd the fruiterers' stalls, fetching from 1s. to 6s. each. They are small, and mostly ill-grown, many not weighing more than half a pound, and none that we have seen exceeding two pounds. Some are in good condition, but many are rotten, and must have heated on the passage. To what variety they belong it is impossible to say, as they are quite unlike the specimens that ripen in this country. It is, however, not improbable that they are small Providences. (*Gard. Chron.* 1843, 575.)

In consequence of the success attending the importation of pine apples from the Bahamas in 1844, upwards of 10,000 additional acres were set apart for their cultivation at New Providence, and about an equal quantity at the small Island of Eleuthera in

1845. In order to improve the cultivation, some thousand offsets of the most approved sorts were sent over to the West Indies last year from this country, and several parties well versed in the cultivation of this fruit have proceeded thither to turn that knowledge to a profit.

The taste for the fruit is becoming more excited in this country, and now that glass is so reduced in price, and better information concerning pine culture is diffused, we expect to see it much more generally pursued.

The pine apple has never been so generally cultivated in this country as it might have been, from an idea that its culture is attended with more difficulty and expense than that of any other fruit; and, also, from the circumstance of the great number of gardeners being ignorant of its cultivation. With respect to the difficulty of cultivating this fruit, every gardener, who knows any thing about it, knows it is much easier grown and fruited than the cucumber early in spring, or than the melon at any period of the year. In short, with the single difference of requiring an artificial temperature, it is as easy, or easier, to grow than a common cabbage. It is not nearly so liable to insects as that plant is in dry seasons; and of two plantations, the one of crowns or suckers of pines, and the other of seedling cabbages, we may venture to assert, that more of the former will perfect

their fruit than those of the latter will perfect their loaf or head. (*Loudon on Pine Apple*, 146.)

The only other country in Europe where the pine apple has been spiritedly cultivated is France.

The establishment of Versailles is the largest in France, but that of Meudon is also remarkable for excellent culture, and the high state of perfection to which this fruit is brought. This is one of the King's private establishments; the Chateau is never occupied by the Royal family, and M. Pelvillain, the chief gardener, is allowed the kitchen garden on his own account. The pine is his hobby, and he spares no trouble or expense in bringing it to perfection; so ardent is his desire to obtain information, that he is learning the English language for the express purpose of reading our treatises and visiting our country, that he may be able to judge for himself of the advantages or defects of the different modes of treatment. He uses peat, and also adopts the open ground culture; and certainly it would be difficult to find plants more vigorous, or finer fruit at Christmas, than he produces; it is no unusual thing to see in his houses Providence, Cayenne, and Enville Pines, weighing from 8lbs. to 10lbs. The Queens, however, are not large, certainly not more than from 2lbs. or 3lbs. on the average; these last he grows principally in pots for the market. The confectioners of Paris seldom buy the larger kinds, they prefer a middle-sized Queen to

any other ; it would, therefore, be useless for him to take any extraordinary trouble in getting this variety very large. He has also raised several seedlings within the last four years ; one of them was sent out about two seasons since ; it is not, however, considered any great improvement upon the original. (*Gard. Chron.* 1844, 55.)

Mr. Dunsford, gardener at Copesthorne Gardens, writing upon the cultivation of the same French establishment, observes, after personal inspection :— The pine is grown to perfection at the Meudon gardens, by M. Pervillian. There, quantity and quality are combined, and the whole of the plants are fruited without pots, on what is termed the system of open-frame culture ; which is a very great saving, both in time and expense, as it does away with the cost of pots and the trouble of potting, and in a great measure with the fermenting materials required for bottom-heat. The suckers produced by the fruiting plants of last season are allowed to remain on the plant after the fruit is cut until the following March, at which period, if the plant be a strong one, the sucker, when taken off, will be almost a full-grown succession plant. These suckers are not potted, as is generally the case in this country, but planted out in a frame, previously prepared with half-rotten leaves, made into a bed, from three to four feet high, with little or no heat in it, as at this time (March) we look forward to a daily

increase of solar heat. This is particularly the case in France, which is favoured with a clearer sky. Half the trouble in linings of dung, which are so necessary in this country, is thus dispensed with. The linings added to the bed of half-rotten leaves, before mentioned, are found to produce heat sufficient to induce the plant to form roots. These are soon followed by others into the mould on the surface of the bed, and when this takes place, the rapidity of their growth may easily be imagined. The principal attention they require after being rooted, is to syringe them almost daily with tepid water, and to keep up a humid atmosphere. As the plants advance in growth, the frame must be raised to give them head room. About the month of August, the plants will be large enough to remove to their fruiting quarters, which at Meudon, and at the Baron de Rothschild's, are a low-roofed house or pit, just wide enough for containing three rows of plants, with a walk at the back. This is heated by flues or fire-heat, which, for plants of that size, is equally as good as hot water, being only intended for drying up the damp, and keeping up a moderate warmth during the winter months. There is no doubt, however, but hot water would be the best for practising the above system in this country. The floor of the house is filled in, to the depth of 16 or 18 inches, with the best soil that can be procured. Loam is very difficult to obtain in the neighbourhood

of Paris ; in fact, good loam, such as pines are grown in near London, is not to be procured by any means ; so that, while pine-growers in France have the advantage in climate, we on this side of the water have a decided advantage in soil. The principal part of their pines are grown in peat: at the Baron de Rothchild's, they have above a thousand pine plants, all growing in that soil. When the plants are ready for removing, it is performed in the following manner :— The frame is first lifted from the plants, so that they can be got at from all sides ; then the plants are raised with a spade, care being taken to remove them with as much soil adhering to their roots as possible. They are then planted carefully in the pit above mentioned, three or four inches deeper than they originally were, to encourage new roots, which, by being kept close, and shaded for a few days, if necessary, they will soon make. After the plants are thus established in their final quarters, no other attention is required, but the general routine of culture adopted for fruiting plants generally, viz., plenty of heat and moisture. (*Ibid.* 1843, 174.)

The Potager, or King's Kitchen Garden, at Versailles, was laid out by "La Quintinie," in the time of Louis XIV., and no expense was spared to render it a worthy appendage to the palace of Versailles, which was then the residence of the gayest court in Europe. The present distribution of the fruit gar-

den retains a great similarity to the plans of La Quintinie, in 1681, with the exception of the forcing department, which, at that time, consisted only of a few frames for melons, cucumbers, and small salads. It was not till about the year 1702 that the pine apple was introduced into the Potager, and so little was then known of its culture, that no mention is made of any fruit having being obtained till 30 years after; in fact, this and other tropical fruits do not appear to have received much attention until the time of the Empire; since the peace, still greater improvements have been made; many new houses, especially for pines, have been erected, and the hot water system all but entirely adopted. The honour to which it has now attained is more particularly due to M. Massey, the present director of the Royal Gardens, and to the chief gardener in the forcing department, M. Grison, who have, within the last few years, so successfully introduced the open bed system of culture. The whole of the succession pits and fruiting houses are now heated by hot water; tan has been entirely discarded: all the water pipes are of copper,—some round, others open, gutters, 5 or 6 inches wide, by 3 deep, like those in use at the Hon. R. Clive's, at Hewell: these last are now coming into general use for bottom heat. In England almost all the pipes for warming the atmosphere are round; there, on the contrary, the greater part are flat and upright, from

6 to 8 inches high, and 1 inch thick ; in these the water is said to circulate quite as freely ; and moreover a great advantage is gained by the comparatively short time in which any given degree of heat may be obtained, the difference being about 3 to 5 ; on the contrary, however, it is lost quite as rapidly. The boilers are of copper, and of a form totally unlike those used in England ; none are conical, and the makers appear to think that form no way superior to theirs. The soils used in England and France for pines are altogether different ; in almost every British pinery, a strong loamy soil is predominant, but at Paris, Versailles, and at almost every other place in France, pines are now grown in peat ; some persons have tried loam and leaf-mould, others loam and peat, or common earth and black sand, but none of these composts have proved satisfactory ; nevertheless, many eminent horticulturists, and among them M. Poiteau, the editor of the "Bon Jardinier," still think that a stronger soil would be better suited to the end in view ; not so, however, the actual growers ; the universal opinion among them is, that pure peat is for every variety the best adapted to ensure a rapid growth, which they consider so essentially necessary to obtain large fruit ; and certainly the health and vigour of the plants, and the enormous fruit which has been obtained in this soil, would lead you to believe their opinion well founded. The treatment of the

plants when young, and indeed throughout all their stages in pots (with the exception of soil), is very much the same as in England. The suckers are planted in August and September, and remain till May in the pits of the lowest temperature, when frames for the summer are prepared of dung and chesnut or oak leaves, well mixed and sweetened, of four feet thickness, which is found to retain a steady bottom heat of 18 to 20 degs. of Reaumur (72 to 75 degs. Fahr.) for a much longer time than from dung alone; upon this is a bed of peat (sometimes mixed with a few decayed leaves and black sand), about eight inches deep, in which the young plants are set at sufficient distance apart to allow for six months' growth. These frames are well protected by straw mats at night, and as the summer advances air is liberally given, and water as occasion may require. Rapid progress under this treatment is soon apparent; here they remain till the end of September or middle of October, when they are once more repotted, in twenty-fours or sixteens, in pure peat, and placed in the winter pits with a bottom-heat of 22 or 25 degs. of Reaumur (82 to 88 degs. Fahr.). In the following May those which are to fruit in pots are shifted into sixteens or twelves, while those for the open ground are planted in the fruiting houses, the soil of which is pure peat 9 or 10 inches deep; the bottom heat is now increased to 25 degs., and the air

is never below 17 or 18 degs. ; in September and October many of the plants are showing fruit, which comes to maturity in time for the Paris season, which commences in December. Such is a brief outline of the open bed system, as practised at Versailles and elsewhere. This treatment has not, however, been found equally advantageous to every kind of fruit ; it is only in the Cayenne, Enville, Jamaica, Providence, and one or two other varieties, that the increase of size has been most apparent ; very little difference has been perceptible in the size of the Queens (at least at the Potager), and by far the greater number of this kind are still grown in pots. The number cultivated in this garden is above 2000 ; more than two-thirds are Queens ; then follow the Providence, Cayenne, Enville, and Jamaica. Many others are grown for the sake of variety, such as Antigua, Poli blanc, Moscow Queen, &c. &c. ; but the first named sorts constitute the grand resource for the Royal Family and Court. (*Gard. Chron.* 1844, 6.)

BOTANICAL CHARACTERS.

ANANASSA SATIVA, the pine apple, is one of a genus included in the Hexandria Monogynia class and order of the Linnean system, and in the natural order Bromeliaceæ. It is the Bromelia ananas of earlier Botanists.

Leaves, ciliate-spinous, sharp-pointed, spike comose. *Root*, perennial, fibrous. *Root-leaves*, from 2 to 3 feet long, and from 2 to 3 inches broad, channelled, often a little glaucous. *Stem*, short, cylindrical, thick, leafy. *Spike*, glomerate, dense, scaly, oval or conic, crowned with a tuft of leaves, similar to the root and stem leaves, but smaller. *Flowers*, bluish, sessile, small, and scattered upon the common, thick, fleshy *receptacle*, which, after the flowers fall off, increases in size, and becomes a succulent fruit, covered on all sides with small triangular scales, and resembling the strobile of the genus *Pinus*, whence its common English name is derived. It is a native of South America, and is now found wild also in Africa and Hindostan.

Although a native of tropical climates, it must not be supposed, however, that the pine apple plant is an exotic of a very tender kind; for, on the contrary, if removed from a temperature of 100 degs., and placed in one nearly freezing for hours, it will exhibit no immediate external change, or that flacidity which would mark the appearance of most other exotics similarly treated. (*Glendinning on Pine Apple*, 8.)

As it is not a tender, so, neither, is it a short-lived plant. We have seen in India an old root that had continued to bear fruit annually for six or seven years, and the suckers on which were still in full vigour. Mr. Hamilton, after some years' experience,

also concludes that a pine apple plant, cultivated without injuring its roots, or moving it, as was the old system, might be fruited from for fifteen years. We are not aware of any chemical analysis of any part of this fruit.

VARIETIES.

For the following list of varieties, and the detail of their characteristics, we are chiefly indebted to the publications of the London Horticultural Society. We have included as varieties some which, by most Botanists, are considered as species, but in these instances we have appended their specific botanical names. The average weights are from the Society's Catalogue, but they are now much below the average weights to which pine apples are grown.

Allen's Seedling, see Mealy-leaved Sugarloaf.

Anson's (Anson's Queen, Lemon Antigua). Leaves long, rather more slender and erect than in the Otaheite, to which it bears a considerable resemblance, particularly in the spines, which are middle-sized, and in the flatness of the leaves. Flowers purple. Fruit cylindrical; before ripening of a darkish green and rather mealy; when ripe of a bright lemon colour. Pips rather above the middle size, prominent at the margins, and depressed in the centre. Scales covering half the pips, and ending in narrow acute points. Flesh white, opaque, entirely without stringyness, very sweet and pleasant, but without acidity. Crown middle-sized, leaves not very nume-

rous. This variety was raised from seed, probably, at Shugborough.

Antigua, Black, (Brown Antigua of Speechley; Antigua, Jagged-leaved Antigua, Wortley's West Indian).—It is readily distinguished by its leaves, which are very long, narrow and acute, rather spreading, of a clear bluish green, the inner leaves being much tinged with a pale brown, upper surface slightly mealy, lower surface very mealy. Spines large, far apart, and regular. Flowers purple. Fruit cylindrical, inclining to oval; before ripening, of a dull purplish green, and thickly covered with meal; when ripe, dark ochre. Pips very large and prominent. Scales covering rather more than one-third of the pips, and terminating in short blunt points. Flesh pale yellow, slightly fibrous, rather soft and melting, with a pleasant acid, remarkably juicy, sweet, and highly flavoured. Crown small. Leaves few and erect. Average weight 5 lbs. Should be cut just before ripening.

Antigua Brown, see New Jamaica.

Antigua, Copper Coloured, see Montserrat.

Antigua, Green, (Smooth-leaved Green Antigua, Smooth Green Havannah, Sans Epines, Malabarica).—Average weight 4 lbs. Its leaves are considerably shorter than those of the Havannah, and of a pale colour; they are also broader, more keel-shaped and much stronger than in that variety, and also entirely destitute of spines. Flowers of a very pale lilac colour. Fruit globular, sometimes inclining to oval; before ripening of a dark green, and very thickly covered with meal, when ripe deep yellow. Pips middle sized, roundish, and projecting to a very acute point. Scales covering about one third of the pips, and ending in narrow short points. Flesh deep yellow, transparent, rather stringy, with a little acidity, but neither very sweet nor highly flavoured. Crown rather large, leaves numerous and reflexed.

Antigua, Lemon, see Anson's.

Antigua Rubra, see Montserrat.

Antigua Aurantiaca, see Smooth Havannah.

Antigua, Smooth Leaved, see Havannah.

Bagot's (Lord) Seedling.—Average weight 3lbs. Leaves remarkably short, broad and flat, bluish green, and thickly covered with meal. Spines, middle-sized and rather irregular. Flowers, lilac. Fruit, bluntly pyramidal; before ripening, dark greenish purple, and thickly covered with meal; when ripe, pale yellow. Flesh white, opaque and firm, with scarcely any fibre, very juicy, and highly flavoured. Crown small, leaves not numerous.

Barbadoes, Lemon-coloured, see Lemon Queen.

Barbadoes, Black, see Black Jamaica.

Barbadoes, White, see Lemon Queen.

Bird's-eye Bahama, see Striped Sugarloaf.

Blythfield Orange.—Colour of flowers, black. Form of fruit, pyramidal. Average weight $3\frac{1}{2}$ lbs. The leaves of this variety bear a strong resemblance to those of the Enville, but differ in being much weaker and less mealy. Spines, middle-sized. The fruit is rather broader at the top than in that variety; the pips are also somewhat larger and less mealy; the colour when ripe bright ochre. Flesh, pale yellow, rather soft and melting, with a pleasant highly-flavoured juice. Crown small, leaves not numerous.

Blood Red (Blood, Claret, Jamaica Purpurea).—This pine is readily distinguished by the purplish red colour of its leaves, which are long, broad, and rather erect. The spines are large and regular. Flowers lilac. Fruit cylindrical, sometimes tapering a little to the summit; before ripening, dark purple and very mealy; when ripe, a reddish chocolate colour. Pips middle-sized, slightly prominent, and half covered with the scales, which terminate abruptly in very short points. Flesh white, rather soft and melting, somewhat fibrous, neither very juicy nor highly fla-

voured. Crown middle-sized, leaves rather numerous and erect. It was imported from Jamaica by the late Major Morrison, of Gunnersbury, under the name of Buck pine, and unnamed plants of it were also received from St. Vincent.

Bogwarp, see Montserrat.

Brazil, see *ib.*

Brazilian Scarlet, see Scarlet.

Buchanan.—Spines middle-sized.

Buck's Seedling.—Colour of flowers lilac. Average weight 12lbs. This variety greatly resembles the Trinidad, but differs in the following particulars: The leaves are not of so robust growth, they are considerably paler, more mealy, and entirely free from any tinge of brown and red, nor are the spines so strong or irregular. The fruit is pyramidal, and before ripening is rather paler and more mealy, the scales much longer, and of a dull whitish or grey colour. The flesh is also somewhat paler, with a richer and more highly flavoured juice. Raised from seed at Elford.

Cape Coast, see Montserrat.

Caraile, Black, see Antigua Queen.

Caraile, Yellow, see *ib.*

Claret, see Blood Red.

Cochineal, see Montserrat.

Cockscomb, see Enville, Welbeck Seedling, and Trooper's Helmet.

Cockscomb, Russian.—Average Weight 4lbs. A good summer fruit. Leaves rather long, broad, and somewhat furrowed, slightly spreading, and rather flat, with revoluted margins of a bluish green, and very lightly tinged with brown, very mealy. Spines rather strong, far asunder, and regular. Flowers, lilac. Fruit globular, rather tapering to the summit; before ripening, of a dark green and rather mealy; when ripe, pale orange. Pips rather above the middle

size and flat, sometimes having small tubercles at some of the angles ; scales covering nearly one half the pips, ending in long blunt points, which adhere closely to the fruit. Flesh, pale yellow, rather transparent, very juicy and sweet, with a rich pleasant acid. Crown rather small, leaves broad and spreading.

Copper, see Montserrat.

Copper Coloured, see Black Jamaica.

Copper Coloured Barbadoes, see Black Sugarloaf.

Crown, see Welbeck Seedling.

Demerara, New (Harrison's New).—Average weight 4lbs. Leaves strong, very broad, and rather long, slightly keel-shaped and spreading, of a dull green colour, and tinged with reddish brown on the upper surface ; the lower surface is remarkably mealy, a feature by which it may be readily distinguished. Spines, rather minute and regular. Flowers, lilac. Fruit globular, depressed at each end, of a dark green colour before ripening, afterwards a dull ochre tinged with red ; very mealy on the centre part of the pips, which are large and prominent. Scales covering half the pips and ending in narrow lengthened points. Flesh white and firm, very juicy, but not highly flavoured. Crown large, leaves rather long and erect.

Dominica, see Mealy-leaved Sugarloaf.

Elford.

Enville (Old Enville, Enville Sugarloaf, Cockscumb).—Average weight 5lbs. Leaves not very long, but rather broad and strong, slightly keel-shaped, somewhat recurved, of a bluish green, and remarkably mealy ; spines middle-sized, thickly set, and very irregular. Flowers, lilac. Fruit pyramidal, of a dark purple, tinged with a brownish red before ripening, and very mealy ; afterwards of a deep reddish yellow, with pale copper-coloured scales, which cover about one-third of the pips, and terminate in lengthened

acute points. Pips generally about the middle size, and slightly prominent. Flesh almost white, opaque, soft and melting, without much fibre, juicy, rather rich and sweet, with a peculiar and pleasant perfume. Crown small, often cockscomb shaped. Raised from seed at Enville Hall, the seat of the Earl of Stamford and Warrington, but at what time is rather uncertain.

Enville, Spring Grove.—The average weight 3lbs. Leaves short, broad and flat, with revolute edges of a bluish green colour, much tinged with brownish purple, and rather thickly covered with meal. Spines middle sized, and rather thickly set and regular. Flowers, lilac. Fruit pyradimal, very broad at its base; before ripening, dark green and rather mealy; when ripe, dark yellow. Pips middle sized, rather flat, and somewhat depressed in the centres. Scales covering rather more than half the pips, and terminating in very short points. Flesh, very pale yellow, slightly fibrous, very juicy and rather sweet, but not highly flavoured. Crown very small, leaves not numerous.

Enville, New.—Spines middle sized; colour of flower, lilac; form of fruit, pyramidal; quality, second rate; average weight 5lbs.

Globe.—Average weight 4lbs. Readily distinguished by the rigid and erect character of its leaves, which are rather narrow and slightly keeled, a bluish green, and very mealy, especially on the under surface. Spines, middle sized and regular. Flowers, lilac. Fruit globular, sometimes rather cylindrical, of a dark olive colour before ripening, afterwards of a darkish yellow, slightly mealy. Pips middle sized, very slightly prominent. Scales covering about one-third the pips, and terminating in rather lengthened points. Flesh yellow, transparent, very juicy, and slightly fibrous, sweet, rich, and rather acid. Crown small, leaves not numerous.

Globe, English, see Black Jamaica.

Globe, Buck's Seedling.—Average weight 5lbs. Leaves long, rather narrow, somewhat keel-shaped and spreading, of a bluish green, slightly tinged with brownish purple, and thickly covered with meal. Spines middle sized, not very strong, but very irregular. Flowers, darkish lilac. Fruit cylindrical, somewhat inclining to a globular form; before ripening, of a dingy dull green, and a little mealy; when ripe, darkish orange. Pips somewhat below the middle size, and a little prominent. Scales covering about half the pips, and ending in lengthened narrow points. Flesh pale yellow, rather close, firm and juicy, with a rich, highly flavoured acid. Crown small, leaves broad, short and reflexed. Raised from seeds in 1819, by Mr. William Buck, gardener to the Hon. F. Greville Howard, at Elford, in Staffordshire.

Globe, Fisherwick Striped.—Spines small; colour of flower, lilac; form of fruit, round; quality, second rate; average weight 4lbs. Readily distinguished from all others by its leaves; in appearance somewhat resembles the King pine, but differs in the following particulars:—The leaves have weak irregular spines on their margins, they are rather of a darker green, slightly tinged with pale brown, more particularly in the centre of the plants; they are also somewhat thickly interspersed with silvery specks on the under surface. Said to have originated at Fishwick, the seat of the Hon. F. G. Howard, from a stool of the Globe pine.

Globe, Russian.—Average weight 3lbs. Leaves rather short and broad, somewhat keel-shaped, spreading, and a little furrowed; of a dull green, much tinged with a dark brown, slightly mealy. Spines, large, long, thinly set and regular. Flowers lilac. Fruit globular, sometimes tapering to the summit; before ripening, dark purplish green, and thickly

covered with meal; when ripe, darkish orange, inclining to a copper colour. Pips large, flat, and a little depressed in the centre. Scales, covering about one third of the pips, which end in long acute points, closely adhering to the fruit. Flesh of a clear yellow, slightly fibrous, very juicy and sweet, with a rich highly perfumed flavour. Crown rather large, leaves broad and spreading. Imported from St. Petersburg by the Society in 1819.

Gold Striped, see Silver-striped Queen.

Green-leaved, with Purple stripes, and spines on the edges, see Striped Sugarloaf.

Harrison's New, see New Demerara.

Havannah (Brown Havannah, Smooth-leaved Antigua, Ripley of some, Old King of some, Semiserrata, Lapete.) Average weight 4lbs. Leaves very spreading, narrow and long, of a light bluish green, considerably tinged with pale brown, and slightly mealy. Spineless except sometimes, when a few appear near the points. Flowers purple. Fruit cylindrical, sometimes tapering a little to the summit, before ripening dark purple and rather thickly covered with meal; when ripe, darkish orange. Pips large, flat, and a little depressed in the centre. Scales covering about one-third part of the pips, and ending in a long reflexed point. Flesh pale yellow, rather solid, and without much fibre, juicy, but neither sweet nor very highly flavoured. Crown large, leaves numerous, long and spreading. Origin unknown. Cultivated by Speechly, at Welbeck, before the publication of his Treatise. Not a favourite with gardeners by reason of the spreading character of its leaves.

Havannah, see King.

Havannah, Downton (Knight's Seedling.)—Spines small. Colour of the flower purple. Form of fruit cylindrical. Quality, second rate. Average weight 4lbs.

Havannah, Smooth (Green Havannah, Antigua Aurantiaca.)—Spines none. Colour of flower purple. Form of fruit cylindrical. Quality second-rate. Average weight 4lbs. The leaves of this are rather less robust than those of the Common or Brown Havannah, and of less robust growth, rather more tinged with brown, and much more mealy. The fruit is of the same form and appearance as the Havannah, but is seldom so large. The flesh is of the same colour and consistency, but abounds with a rich, sweet, highly flavoured juice. The crown is generally considerably smaller than in that sort. The origin of this pine is unknown, it is not however of recent origin or introduction, having been grown for a considerable length of time in the pine stoves of different parts of England.

Havannah, Smooth Green, see Green Antigua.

Hussar, see Trooper's Helmet.

Indian Creole, see Montserrat.

Jamaica Black (Jamaica, Black Barbadoes, Copper-coloured, Tawny, St. Vincent's Sugar-loaf, Montserrat of some).—Average weight 4lbs. Best winter pine. Leaves rather long and narrow, slightly spreading, and somewhat keel-shaped, of a dull green, tinged with a dark brown colour, and rather mealy. Spines small, short, regular, and thinly set. Flowers, purple. Fruit, oval, not much lengthened, rather compressed at the ends; colour, before ripening, very dark olive; afterwards a dark orange, inclining to that of copper. Pips, roundish, irregularly angular, about the middle size, rather prominent at the margins and concave in the centre. Scales, covering one-third the pips, and terminating in lengthened points. Flesh, pale yellow, opaque, firm, slightly stringy, very rich, juicy, and high flavoured. Crown, large, spreading, and very mealy.

Jamaica, New (New Black Jamaica, Brown An-

tigua, English Globe, St. Kitt's, Montserrat of some). —Average weight, $3\frac{1}{2}$ lbs. Good in summer. This differs from the Black Jamaica in the colour of the leaf, which is rather paler, and in the margins being slightly reflexed. Leaf spines, small. The fruit is pyramidal and slightly mealy. The colour black (hence Speechley's name), on approaching maturity changing to that of a dark orange. Pips differ from those of the Black Jamaica by being half-covered with the scales, and rather more prominent and angular. Flesh, pale yellow, somewhat opaque, slightly fibrous, sweet and rather acid, very pleasant, rich, and high flavoured. Crown, middle-sized, leaves rather numerous and spreading.

Jamaica Purpurea (see Blood Red.)

Java, Green (Narrow-leaved Java). — Average weight, 4lbs. Readily distinguished by its long, broad, palish, green leaves, with small feeble spines; they are also very flat, and entirely free from any tinge of brown or purple. Flowers, large, dark, bluish purple. Fruit oval, sometimes tapering a little to the summit, weighing from 4 to 5lbs.; before ripening, light green, and lightly covered with meal; when ripe, of a fine clear citron colour. Pips rather above the middle size, and flat. Scales cover fully one-third of the pips, and end in long narrow points. Flesh, pale yellow, rather soft, juicy, and melting, with a rich pleasant acid. Crown, middle-sized, leaves not very numerous. Obtained by Sir Thomas Stamford Raffles, during his residence in Java.

Java, broad-leaved, see Trooper's Helmet.

King (Grassgreen King, Common King, Old King, Havannah of some). Spines none. Average weight, 3lbs. This is the "*Ananas viridis inermis*," of the French. Leaves, rather long, somewhat broad and keel-shaped, margins destitute of spines, and sometimes a little undulated; of a clear shining yel-

lowish green, and entirely free from mealiness; its growth is also very peculiar, the centre leaves embrace each other very closely, and require considerable force to separate them. Flowers, purple. Fruit, cylindrical, inclining to ovate, of a bright olive colour before ripening, bright orange when ripe. Flesh, yellow, opaque, firm, and free from fibre, sweet and pleasant, with very little acid. Crown large. This pine, according to Martin, in his edition of "Miller's Dictionary," was raised from seeds taken out of a rotten fruit which came from the West Indies, to Henry Heathcote, Esq.

King, see Havannah.

Knight's Seedling, see Downton Havannah.

Lahete, see Havannah.

Malabarica, see Montserrat.

Mocho, see Brown-leaved Sugarloaf.

Montserrat (Copper, Cape Coast, Bogwarp, Red Ripley, New Ripley, Copper-coloured Antigua, Cochineal, Brazil, Malacca, Sumatra, Antigua Rubra, Indian Creole).—Easily distinguished from all other variety by the dark purple colour of the spines, which are rather small and irregular; good specimens of it will weigh from 3lbs. to 5lbs. Flowers purple. Fruit cylindrical, sometimes broader at the top and narrowing downwards; before ripening, dark green and mealy; afterwards of a pale orange, tinged with a copper colour. Pips, middle sized and rather flat. Scales covering one-half the pips, of a deep red towards the points, which are rather lengthened. Flesh solid, lemon-coloured, semi-transparent, somewhat mealy, juicy and acid, without much flavour or sweetness. Crown rather large, leaves numerous.

Montserrat, see Black Jamaica and New Jamaica.

Montserrat, Heaton House, see Ripley.

Olive Green, see St. Vincent's.

Olive, New Green, see Green Providence.

Olive, Striped-leaved, see Striped Queen.

Ordinaire, see Queen.

Otaheite (Anson's).—Average weight 6lbs. Very handsome. Leaves long, rather broad, and of erect growth, nearly equal in breadth until near the top, where they terminate rather acutely; they are also particularly flat, and of a dark bluish green, slightly tinged with brown, and a little mealy on the upper surface, very mealy on the lower surface. Spines middle sized and remarkably irregular. Flowers, lilac. Fruit cylindrical, inclining to oval; upon ripening, deep olive green, covered densely with a cinereous meal; when ripe, orange yellow. Pips large and flat. Scales covering rather more than one-third the pips, and ending in short points, which adhere closely to the pips. Flesh, pale yellow, rather stringy and slightly acid, with an abundance of juice, but not particularly well flavoured. Crown small, leaves rather few and erect.

Peploe Seedling.—Spines middle sized; form of fruit cylindrical; quality second-rate; average weight $3\frac{1}{2}$ lbs.

Pitch Lake, see Trinidad.

Prince of Wales's Island, see Striped Surinam.

Prince of Wales's Island, Striped, see *ib.*

Providence, Green.—The leaves of this sort are very distinct from all others; they are long, very broad, slightly spreading and keel-shaped at the base, tapering to a lengthened point; the upper surface is dull green, with scarcely any meal, the lower surface is very mealy. Spines middle sized and regular. Flowers purple. Fruit pyramidal, broadish at the top; before ripening of a dark green, when ripe of a pale orange, slightly mealy. Pips rather above the middle size and slightly prominent. Scales covering one-half the pips, with long narrow pointed ends. Flesh pale yellow, opaque, slightly fibrous, sweet and

pleasant, without much acid. Crown small, leaves not very numerous. Average weight, $4\frac{1}{2}$ lbs. This variety was obtained from seed at Wollaton, the seat of Lord Middleton.

Providence, Prickly, see Welbeck Seedling.

Providence, White (Providence, New Providence, Mealy-leaved Providence, Wollaton Providence, Wollaton Green Providence). — Average weight 7 lbs. ; largest of the varieties here enumerated, excepting the Trinidad. Leaves large, long, broad and spreading, of a light bluish green colour, sometimes blotched with a deeper shade, and very mealy ; spines very small, thickly set and rather irregular. Flowers large, dark purple. Fruit oval or tun shaped, nearly equal in size at top and bottom, very dark green or purple, and thickly covered with meal ; on approaching maturity gradually changing to a reddish yellow. Pips very large and nearly flat, sometimes a little depressed in the centre. Scales covering nearly half the pips, and terminating in shortened blunt points. Flesh white, opaque, sweet and juicy, without much flavour, slightly stringy and rather soft and melting. Crown large, leaves numerous and rather spreading.

Queen (Broad Leaved Queen, Common Queen, Narrow Leaved Queen, Ordinaire). — Average weight $2\frac{1}{2}$ lbs., though it can be grown much larger. One of the best and most useful. Leaves very short, broad and stiff, somewhat spreading and keel-shaped, of a bluish green, and thickly covered with meal. Spines large, strong, rather far apart and regular. Flowers lilac. Fruit cylindrical ; before ripening, a lightish green and mealy ; when ripe, a rich deep yellow. Pips rather below the middle size and a little prominent. Scales covering rather more than one-third the pips, ending in lengthened points. Flesh pale yellow, very slightly fibrous and melting, remarkably juicy and sweet, with a rich pleasant acid. Crown middle sized, leaves numerous and a little

spreading. The origin of this variety is uncertain ; it is the *Ananas Ovale* of Miller's Dictionary, and probably the sort originally introduced into this country.

Queen, Anson's, see Anson's.

Queen, Antigua (Black Caraile, Yellow Caraile, Lord Effingham's).—Average weight 4 lbs. Leaves short, broad, keel-shaped, and slightly spreading, dull green, and very mealy on the under surface. Spines large, strong, far asunder and regular. Flowers dark lilac. Fruit cylindrical, sometimes roundish ; before ripening, dark olive green and rather mealy, when ripe dull yellow. Pips rather above the middle size, prominent. Scales covering about one third part of the pips, and ending in a short blunt point. Flesh white, firm, remarkably juicy, a little sugary but not highly flavoured. Crown rather large, leaves numerous and spreading.

Queen, Barbadoes, see Lemon Queen.

Queen, Green.—Spines large ; colour of flower lilac ; Form of fruit cylindrical ; quality best ; average weight $2\frac{1}{2}$ lbs.

Queen, Lemon (Lemon coloured Barbadoes, Barbadoes Queen, White Barbadoes, Ripley's New Queen).—Easily distinguished by its leaves, which are grooved or channeled, and the margins often involute, of a bluish green colour, with a considerable quantity of mealiness. Spines middle sized and irregular. Flowers lilac and large. Fruit cylindrical ; before ripening of a bright lightish green, when ripe pale lemon colour, and slightly mealy. Pips rather above the middle size and flat. Scales covering about one half the pips, ending in short points which adhere closely to the fruit. Flesh pale yellow, transparent, very juicy, a little stringy, rather sweet and pleasant, although not very highly flavoured. Crown middle size, often cockscomb-shaped ; generally weigh-

ing from three to five pounds ; does not swell very readily during winter.

Queen, Moscow. Spines large ; colour of flower lilac ; form of fruit cylindrical ; quality excellent ; average weight $2\frac{1}{2}$ lbs.

Queen, Ripley's New, see Lemon Queen.

Queen, Purple Striped, see Striped Sugarloaf.

Queen, Ripley's. Spines large ; colour of flower lilac ; form of fruit cylindrical ; quality best ; average weight $2\frac{1}{2}$ lbs.

Queen, Silver Striped (Silver Striped, Gold Striped). Spines large ; colour of flower lilac ; form of fruit cylindrical ; quality middling or bad ; average weight 2 lbs.

Queen, Striped (Striped Olive).—Spines large ; colour of flower lilac ; form of fruit cylindrical ; quality second rate ; average weight $2\frac{1}{2}$ lbs. Swells badly.

Ribbon Gross, see Striped Surinam.

Ripley (Ripley's, Old Ripley, Heaton House Montserrat).—Average weight $2\frac{1}{2}$ lbs. Leaves broad, rather long, and slightly recurved, dark green, much tinged with reddish brown, and mealy on both surfaces. Spines rather large, strong and irregular ; margins reflexed and sometimes a little waved. Flowers purple. Fruit, roundish ovate, sometimes rather cylindrical, slightly compressed at either end ; before ripening very deep green, and thickly covered with meal on the middle parts of the pips ; when ripe of a pale copper colour. Pips rather above the middle size and rather prominent ; scales covering about one-half the pips, and terminating in lengthened acute points. Flesh pale yellow, opaque, very sweet and rich, firm and crisp, not stringy, and of a very agreeable flavour. Crown about the middle size, leaves rather numerous and spreading. This was raised upon an estate called Ripley, in the Island of Jamaica.

Ripley, see Havannah.

Ripley, New, see Montserrat.

Ripley, Red, see *ib.*

St. Kitt's, see New Jamaica.

St. Thomas's, see St. Vincent's.

St. Vincent's (Green St. Vincent, Green Olive, St. Thomas's, Stubton Seedling, Bahama Sugarloaf).—Average weight $2\frac{1}{2}$ lbs. Swells well in winter. This has been described by Speechly to have leaves of the "same length as the Queen;" if well grown they will be found to be much longer, and differ only from the Green Providence in being narrow, less keel-shaped, and the upper surface paler green and rather more mealy. Spines middle sized. Flowers purple, middle sized. Fruit bluntly pyramidal, slightly mealy, and of a dull olive colour; when ripe of a dingy yellow. Pips middle sized, flat, and rather depressed in the centre. Scales covering nearly half the pips; the tops are short and adhere closely to the fruit, which gives it rather an even appearance. Flesh pale yellow, opaque, juicy, crisp, without much fibre, rich, sweet, and very highly flavoured. Crown middle sized, leaves rather numerous and slightly spreading.

Sans Epines, see Green Antigua.

Scarlet, Ananassa Bracteata, (Brazilian Scarlet).—Spines large; colour of flower dark purple; form of fruit pyramidal; quality middling or bad; average weight 4 lbs. Only valuable for the beauty of its flowers. Leaves remarkable long and flat, rather broad and flaccid, of a yellowish green, often tinged with pale brown, and almost destitute of mealiness; spines very strong, far asunder and rather regular. Flowers large, dark purple, contrasting beautifully with the scales, which are of a brilliant scarlet at that stage of the growth. Fruit pyramidal, before ripening of a dullish yellow colour, on its approaching maturity it changes to a pale green, and becomes a little mealy; when ripe palish yellow. Pips small

and slightly prominent, being half covered with the scales, which terminate in very long, broad, reflexed points, of a dull scarlet colour. Flesh very pale yellow, slightly fibrous, very juicy and soft, slightly acid, without much flavour. Crown large, leaves rather numerous and erect.

Semiserrata, see Havannah.

Sierra Leone.—Average weight 4lbs. Leaves long, broad and rather flaccid, with revolute undulated edges, of a clear bluish green, and, from the circumstance of its being a very free grower, often considerably blotched with a darker colour. Spines short, middle sized and regular. Flowers purple. Fruit cylindrical; of a dull green colour, tinged with red; when ripe, it gradually changes to a dull ochre colour, thickly covered with meal. Pips rather below the middle size and slightly prominent. Scales covering nearly one half the pips, and terminating in lengthened reddish coloured points; when approaching maturity it gradually changes to a dull ochre colour. Flesh very pale yellow, almost white, tender, abundantly juicy, free from fibre, crisp and melting, sweet without acidity, pleasant though not rich. Crown large and rather sweet, often accompanied by gills at its base, leaves numerous; it is also inclined to emit suckers at the base of the fruit, and those on the stem are inclined to fruit before the other is half matured.

Silver Striped, see Striped Surinam and Silver-striped Queen.

Stanton. Spines middle sized.

Stubton Seedling, see St. Vincent's.

Sugarloaf, Black. (Copper coloured Barbadoes).—Spines middle sized.—Colour of flower black. Leaves purple. Average weight $3\frac{1}{2}$ lbs. The fruit pyramidal like the other varieties of Sugarloaf; the colour is darkish purple, and slightly mealy before ripening; when ripe light orange. Pips rather above the mid-

dle size and flat, sometimes a little depressed in the centre, and covered to the extent of one-third by the scales, which end in a very short blunt point. Flesh very pale lemon-colour, rather stringy, very juicy, and sweet, with an agreeable pleasant acid. Crown rather large, leaves few and erect.

Sugarloaf, Brown.—Spines middle sized. Colour of flower lilac. Average weight 4lbs. The leaves of this variety are different from all the other Sugarloaves; in appearance they much resemble the Enville, but are less mealy and more tinged with brownish red; the fruit also bears a striking resemblance to that of an Enville, but is nearly destitute of mealiness. Flesh is rather firm, deep yellow, opaque, without much fibre, very juicy, rich and highly flavoured, with a little acidity. Crown resembles that of an Enville.

Sugarloaf, Brown-leaved. (Striped Brown Sugarloaf, Mocha, Antigua Sugarloaf.)—Average weight 4lbs. Leaves rather strong, broad, somewhat keel-shaped, and slightly spreading, dark green, much tinged with purplish brown, rather mealy. Spines middle sized and regular. Flowers lilac. Fruit cylindrical, of a dingy green, and considerably covered with mealiness before ripening; when ripe dark yellow, inclining to orange. Pips large, slightly prominent. Scales covering nearly one-half the pips, and ending in short blunt points. Flesh deep yellow, rather opaque and slightly fibrous, not very juicy, but highly flavoured, and particularly sweet and rich. Crown middle sized, leaves rather numerous and spreading.

Sugarloaf, Bahama, see St. Vincent's.

Sugarloaf, Mealy-leaved. (White Sugarloaf, Dominica, New Mealy-leaved Sugarloaf, Allen's Seedling, Green Sugarloaf of some.)—Spines middle sized; average weight 3lbs. Flowers lilac. Fruit pyramidal, of a lurid green and slightly mealy; when ripe of a pale yellow, inclining to lemon colour. Pips rather

below the middle size; flattish scales covering rather more than one-third of the pips, and ending in lengthened acute points. Flesh very pale yellow, almost white, transparent, rather soft and fibrous, sweetish without acid, slightly aromatic, not very pleasant. Crown small, leaves rather numerous.

Sugarloaf, Orange.—Average weight 3lbs. Leaves rather long and narrow, somewhat keel-shaped and a little spreading, of a dull green, considerably tinged with dark brown, and rather mealy; spines short, thinly set, and regular. Flowers, pale purple. Fruit, cylindrical; before ripening very dark olive, somewhat shining and slightly mealy; when ripe, deep yellow, inclining to an orange colour. Pips large and flat. Scales covering about half the pips, and ending in short, blunt, reflexed points. Flesh, pale yellow, almost destitute of fibre, very juicy, and sweet, with a rich highly-flavoured acid. Crown, middle-sized, leaves numerous and spreading. Raised at Blithfield, the seat of the Right Hon. Lord Bagot.

Sugarloaf, St. Vincent's, see Black Jamaica.

Sugarloaf, Striped (Purple-striped Queen, green-leaved with purple stripes, and spines on the edges; Green Sugarloaf, Green Striped Sugarloaf, Richly Striped Sugarloaf, White Sugarloaf, of some; Bird's Eye Bahama, Brown Striped Sugarloaf.)—Spines large; colour of flower pale lilac; Average weight 3lbs. Fruit pyramidal, as the other Sugarloaves, of a clear palish green colour, and rather mealy; when ripe, of a bright yellow. Flesh, deep yellow, semi-transparent, slightly stringy, very juicy, and sweet, with a slight aroma, but without much acidity. Crown middle-sized, leaves rather numerous.

Sugarloaf, Striped Smooth-leaved (Smooth-leaved Sugarloaf).—Average weight, $2\frac{1}{2}$ lbs. Readily known by its leaves, which are entirely destitute of spines, and striped with dull purple. The flowers are very

pale lilac. The fruit pyramidal, as the other varieties of Sugar-loaf. Flesh, deep yellow, remarkably soft, with scarcely any fibre or acidity, a little sweet, but neither rich nor juicy. Crown middle-sized, leaves very numerous. This worthless variety originated some time previous to the publication of Speechley's Treatise, and seems now to be almost lost in this country.

Sugarloaf, White, see Mealy-leaved Sugarloaf.

Sumatra, see Montserrat.

Surinam.—Average weight 3lbs. Leaves rather narrow, long and slightly spreading, of a bluish green colour, a little tinged and slightly covered with mealiness. Spines rather deep and not very regular. Flowers, lilac. Fruit, cylindrical; of a dull green before ripening; when ripe, a deep orange and rather mealy. Pips roundish, middle-sized, projecting, and pointed. Scales covering about one-third part of the pips, and ending in lengthened reflexed points. Flesh, pale yellow, transparent, rather stringy, and very juicy, but neither sweet, rich, nor acid.

Surinam, Striped (Striped Silver and Pink Surinam, Silver Striped, Ribbon-grass, Prince of Wales's Island, Striped Prince of Wales's Island).—Average weight $2\frac{1}{2}$ lbs. This has been described by Speechley to exceed in beauty the whole tribe of variegated plants, not only in the leaves, which are beautifully striped with dark green and delicate white, tinged with a fiery red; but also in its fruit, which is cylindrical, and variously marbled with red, green, yellow, and white. Leaf spines small. Pips small, rather prominent, and covered to the extent of one-third by the scales, which terminate in narrow sharp points. Flesh, dullish yellow, very acid, and moderately flavoured. Crown middle-sized, of the same character as the leaves. Although a beautiful, this is a worthless variety.

Trooper's Helmet (Cockscomb, Hussar, Brown-leaved Java).—Average weight 4lbs. Very handsome. Leaves rather long, flat and erect, of a pale yellowish green colour, and mealy on the under surface. Spines middle sized and regular. Flowers purple. Fruit roundish, cylindrical; before ripening, pale green and rather mealy; when ripe, dark ochre. Pips large, flat, depressed in the centre and plaited round the margins. Scales covering half the pips. Flesh of a whitish colour, very juicy and high flavoured, without sweetness or briskness, rather of a coarse and stringy nature. Crown large and spreading, leaves numerous. We have received it from Java, under the name of Java Broad-leaved and Java Narrow-leaved, and from St. Vincent's.

Trinidad (Pitch Lake).—Average weight 12lbs., said to weigh sometimes 26lbs. Leaves keel-shaped, very long and straggling, broad at the base, and tapering regularly to the apex, dull green, much tinged with brownish purple, particularly on the spines and inner leaves, under surface very mealy. Spines middle sized, remarkably irregular and growing in clusters, they are in the middle degree of strength, and thickly set. Flowers lilac. Fruit of an elongated conical form, the greatest diameters of which are in the proportion of $12\frac{1}{2}$ inches in height, by $5\frac{1}{2}$ inches in breadth; before ripening, dark olive, and lightly covered with meal; when ripe, dark orange, and slightly tinged with red on the lower part of the pips, which are large, of a roundish form, and only very slightly angular; the margins are rather elevated, with the centres depressed, excepting the lower part of the fruit, where they are a little prominent. Scales cover about half the pips, and end in lengthened acute points at the lower part of the fruit, but near the summit they are much shorter. Flesh pale yellow, soft, with little fibre, very delicate and highly

flavoured. Crown very small, contributing, in continuation from the fruit, to give the whole the sharp termination of a regular cone. The leaves are reflexed, and considerably tinged with reddish brown.

Waved Leaved (*Ananassa debilis*).—Spines small. Colour of flower pale purple. Form of fruit oblong. Quality second rate. Average weight $3\frac{1}{2}$ lbs. Leaves large, flacid, spreading, wavy, dark green, slightly mealy above, and stained with dark purple; teeth reddish, small equal sized; the full grown leaves are about three feet long, and a well grown fruiting plant occupies a space of about three feet in diameter. Flowers pale purple. Fruit oblong, or tun-shaped; before ripening very dark green, when ripe dull yellow, with a greenish cast on one side; nearly destitute of mealiness. Pips projecting, middle sized, pointed as long as the scales, the uppermost of which are nearly destitute of a point, the lowest have a withered, deeply-toothed point. Flesh yellow, transparent, very tender, delicate, and juicy; flavour extremely pleasant, with a slightly perceptible acid. Core woody. Crown large, not disposed to become cockscomb-shaped, or to be proliferous.

Welbeck Seedling (Cockscomb, Crown, Prickly Providence).—This sort is readily distinguished from all others by its leaves, which are long, slender and spreading, broad at the base, and tapering to a very acute point; of a dull green and only slightly mealy. Spines large, far asunder and regular. Flowers small, dark purple. Fruit somewhat cylindrical, generally broader at the top than at the base; before, ripening dark olive; when ripe, pale lemon colour; very mealy on the centre of the pips, which are large, flat, rather wrinkled and depressed in the centre. Scales covering nearly half the pips, ending in short blunt points. The flesh is very pale yellow, almost white, semi-transparent, melting and juicy, slightly acid,

with a rich agreeable flavour. Crown rather large, sometimes cockscomb-shaped, leaves not very numerous.

Wortley's West Indian, see Black Antigua.

CHARACTERISTICS OF EXCELLENCE.

THE perfection of pine-growing is not only obtaining them of a large size, handsome proportions, and full flavour, but in regular succession throughout the year. Upon the last circumstance we have no opinions to offer in the present section, but it will be a portion of that devoted to the culture of this fruit.

The characteristics of excellence are health and vigour in the plant, with a strong, bold shew of fruit, good height in the number of pips, strength of stalk, and the fruit boldly up in sight, the blossoming strong and of a dark colour, with a fruit swelling freely and quickly after every pip is perfectly well set; the swelling to be even throughout, without any deformity; and the crown proportionate, small and sturdy; colour, bright; and if the juice is oozing from the rind as thick as honey, and, when cut and handled, it is found to be much heavier than its apparent size betokened, and its flavour exquisite and superior, the specimen will be first rate.

Respecting the size of the crown, a pine plant will never produce one unsightly and unproportioned if

some mistake has not crept into its culture. A Queen pine, in depth 12 pips, and fully 12 inches in length, with its pips swelled out evenly from stem to crown, and measuring from 18 to 20 inches in circumference, will weigh from 6 to 8lbs. A crown on such a fruit should be no more than 3 inches in length, and it should be rather sturdy and perfectly upright. We have swelled a Queen pine of $8\frac{1}{2}$ inches in depth to the weight of 6lb. 4oz., with a crown on its summit only 2 inches high; the fruit was 22 inches in circumference, and nearly the same size at the summit as it was at its base. It is very possible that fruit, with nearly double the number of pips in depth, may at some future day be swelled out to a size in proportion to the above.

The Moscow Queen is a strong grower, and will, under good management, produce larger fruit than the other varieties of Queen. It is a very good variety, though generally considered not so high in flavour as the Queen, and lighter in colour. A well swelled fruit does not look well with a crown more than 3 inches in height.

The Black Jamaica is a superior fruit at all seasons. We have no better variety for swelling and flavour in the winter season. If it shews a fruit strongly, with seven or eight pips in depth, and is swelled out to the circumference of 22 inches by 9 inches in depth, it is a handsome fruit; and if the crown is managed

in proportion, it should not be more than 3 inches in length. Such a fruit will weigh 7lbs. or more, if very full of juice.

The Green Olive is another superior winter-swelling variety. It does not produce a fruit very large, but good flavoured; is firm and heavy, weighing according to its size. The largest and heaviest cut at Bickton weighed 6lbs. 4oz.; the fruit was 10 inches in length and 17 inches in circumference; the crown was not quite 2 inches high.

The Enville is a handsome pine when of superior growth, and well proportioned from stem to crown. Its quality is coarser than that of the foregoing, and not so high in flavour; it requires to be eaten immediately after being cut, being apt to become insipid if kept even a short time. A healthy young plant has produced a fruit between 9 and 10lbs. in weight, 24 inches in circumference near the base, rather above 4 inches in length, and the crown not quite 3 inches high. It is not a fruit heavy in proportion to its dimensions.

The Old Globe is esteemed by some on account of its erectly-growing foliage not taking so much room as others of more spreading growth. It requires cutting as soon as it commences colouring, and to be hung up in a dry, airy situation, to perfect its colour. It must then be eaten immediately, or it will soon lose its flavour. Mr. Barnes has grown a fruit of this

variety 7lbs. in weight, and but little more than 8 inches in length. It is a heavy weighing fruit if well swelled, and the crown, to look correspondingly, should be no more than 3 inches in length.

The Russian Globe will weigh 6 or 7lbs., or even more if well cultivated. The pips, if well swelled, are very flat, and, like the other black varieties, it requires to be eaten early after being cut, or its flavour will be much reduced.

The Providence attains a large size, and certainly has a noble appearance; but it requires much room, the leaves, if well cultivated, growing long, broad, and very spreading. If full vigour is supported throughout its growth, this variety will produce immense sized fruit, with pips very large at the base, and flat. A fruit weighing 12lbs. does not look disproportioned, if its crown is more than 4 inches high.

The sizes mentioned in the proceeding selection exceed the averages assigned to the several varieties in the alphabetical list we have given, but then the larger sizes have been attained under the improved mode of cultivation adopted at Bicton. Dr. Lindley is quite right in observing that a gardener was thought something of thirty years ago who could make his Queen Pines average 2lbs.; and a $2\frac{1}{2}$ lb. fruit was a prodigy. Moreover, all those men who continue to follow the routine of cultivation which was then

adopted, obtain the same result, and yet they still fondly believe that they continue at the head of this branch of their profession. When they see announced that heavier pines are procured in various gardens, some of them doubt, others flatly contradict the statement, while a third section cry out at the injury occasioned them by such announcements. "Where are these gardens of Bicton," says one, "in which Queens average above $5\frac{1}{2}$ lbs.?" He does not give himself the trouble to consult his map, which would have told him that they are near Sidmouth, and belong to Lady Rolle.

So far is pine-growing from having reached its acmé that it is the opinion of persons well capable of judging correctly, that we shall some day have Queen pine apples of 10lbs. weight. We do not think this improbable, for we can perceive no reason to the contrary, and much in favour of the expectation. In short, now that pine apples are treated like tropical plants, there is a chance for them to attain super-excellence; whilst, so long as gardeners persevered in docking their roots, the wonder was that the pines did not refuse to grow at all. (*Gard. Chron.* 1845, 815.)

With regard to the objection, that some gardeners, by growing large pines, injure those who grow those which are smaller, this can only happen, and justly, to those who will not do better. What a gardener should do, is to set before his master the relative ex-

pense of growing Queens to the weight of 3 or 4lbs., and 6 or 7lbs., and then to inquire which he prefers. In the majority of cases he would find his master preferring the smaller size, if well grown ; because it is only on special occasions that very heavy pines are really wanted ; and always to place on the table a Queen of 6lbs. weight, where one of only 3lbs. is required, would be unnecessary waste. There is, however, no family where pines are cultivated, in which to have the largest possible fruit, occasionally, is not a desideratum. If it were not so, the Providence and Enville pine apples, which have little but size to recommend them, would go out of cultivation. Again, the surplus pines, in many gardens, are regularly sent to market, and in that case it would have to be ascertained which is the most profitable, a crop of very large, or of middle sized, well-grown pines. And it is in this way that market gardeners probably view the question. They grow what best suits the market, and what will produce them the most profit. (*Ibid.* 1844, 131.)

We will remark, in conclusion, that if a pine apple is required to keep as long as possible, its crown should be removed, for the vegetation of the crown injures the flavour, upon the same principle that an onion or carrot is similarly deteriorated when it begins to sprout in the spring.

MODES OF PROPAGATION.

THERE is no doubt that the natural modes of propagating the pine apple are by seeds and suckers, but to these, the gardener's art has added propagation by the crown and cuttings of the stem. We have a strong opinion that, like other fleshy-leaved plants, it might be propagated, also, by leaves slipped off from the bottom of the stem.

Seeds.—The seeds are small, dark brown, not unlike those of the Siberian crab, and are contained within the pips or protuberances of the fruit. Mr. Speechley was of opinion, that its seed is rarely perfected either in this country, or even in the West Indies. The latter was certainly an error even when Mr. Speechley wrote, and under the better mode of cultivation now adopted, seed is also of very frequent occurrence in fruit ripened in this country. We can state this from actual observation; and moreover from similar experience, we think, that if practical men were to address themselves to hybridising the best varieties now in cultivation, we should very soon have others very superior even to their parents, and of a much hardier nature than any we have in cultivation at present. Three years ago, Mr. Barnes sowed three seeds of an Enville pine, given to him by Lady Rolle. They were sown in lightish turfy loam, mixed with a little charcoal, well drained in a 7-inch pot, filled to

within an inch of the top. The seeds were placed near the centre, upon the soil, and covered 3-8ths of an inch deep with the same kind of soil, mixed with a little charcoal dust and sharp sand, to prevent its binding. The pot was plunged to the rim, at front of the fruiting pines, in the stove, in a very moderate heat of barely 80 degs. at that time, and the atmospheric heat kept about 60 degs. or barely so much. The surface of the soil was covered with a bell glass. The seeds quickly vegetated, and the seedlings were above the surface like sturdy grass plants, in the course of twenty days from the time of sowing. They were pricked into thumb pots, making use of the same kind of soil, rather sandy and open with charcoal, the thumb pots placed each inside another pot, filled with porous rooty soil, and then plunged to the rim again in the same situation, under a bell glass; watering and giving air as they required it, dispensing with the glass altogether as they became established, and shifting them into larger pots when necessary. By the month of March, in the following spring, they were become sturdy plants, with leaves 5 or 6 inches in length, thick and fleshy, and were placed amongst the other succession plants. They differed materially from each other, and not one resembled their parent, the true Enville variety, either in countenance, colour, or habit, of plant or foliage. Each plant fruited within two years and a half from the time of sowing

the seed, producing pretty, sizeable, well-swelled fruit, and were spoken of as being high flavoured, but differing in size and shape from each other; one only was of a pyramidal shape, similar to the Enville, but not in colour, and the other two were somewhat oval shaped. There was, at the time the parent Enville was in bloom, in the same house, some Queens, a Black Jamaica, and a Green Olive. We cannot account for the hybridising which certainly did take place, farther than the bee had free access at the time of ventilation.

Mr. Speechley's directions for raising seedlings are as follows:—The pots should be prepared and filled with soil to within one inch of the top, and plunged in a warm part of the tan-bed, a day or two before the seed is sown, that the soil may become heated. The seeds should be sown an inch apart, and covered to the depth of about a quarter of an inch. Place a piece of glass over the top of the pot, to which it should fit very close, or cover the whole with a small hand glass; this, by preventing the mould from drying, and giving an additional heat to it near the surface, will soon cause the seeds to vegetate. Neither air nor water will be required till the plants begin to appear, when a little air should be given in the day-time only; let the plants be sprinkled over with water every four or five days, in case the weather is fine and clear; but should it prove dark and moist, once in ten

days will be sufficient. As the plants advance in size, a greater quantity of air should be given them in proportion to their progress, and by the time they have six or eight leaves, they will have strength to withstand the general air of the hot-house, and from that time will require a little water twice a week. The first leaves of seedling pines are very small and tender, much resembling the smallest blades of grass; the plants therefore should by no means be left uncovered till they have acquired strength, as the Onisci or Wood-lice (with which most hot-houses abound) would in one night destroy the hopes of the crop. It will also be advisable, when the glasses are first taken off the pots, to sprinkle the plants with water, and immediately dust them with a little snuff or tobacco-dust, which, being put into a puff, or small piece of gauze, may be thrown upon them with ease; a very small quantity will prevent those insects from injuring the plants. This method will also secure other young and tender plants, kept in hot-houses, from the like accident. By the end of August the Seedling pines will be grown to a proper size for transplanting, when they should be put into small pots filled with the same mould recommended for crowns and suckers; and from that time their treatment requires no difference from that of the others. (*Speechley on the Pine Apple*, 256.)

Suckers.—There was formerly a prejudice against

propagating the pine apple from suckers, but this prejudice has departed, since finer fruit has been proved to be more easily attainable from them than from crowns, and that vigorously growing plants are those only which will produce it. Suckers usually and most readily produce vigorous plants. Always select the finest suckers, and from those plants only which have produced very superior fruit.

If a stool is not intended to be refruitied from, as soon as its fruit is cut, take out the old stool, strip down the leaves, and cut off a piece of the stem or trunk with a hatchet or strong knife to the length of 3 inches or thereabouts, with a sucker or two growing from it. Do not usually allow more than two to grow on a plant; if it offers to produce more, twist them out carefully in a young state, but a strong healthy plant will not put forth a superfluity of suckers, unless subjected to extreme heat, cold, or the application of water to the axils of the leaves. Subjecting plants to sudden checks is the readiest method of producing a stock of plants. Plant immediately the pieces of stem in the pots, and the suckers will maintain their vigorous health almost unchecked; if care be taken in potting, and plunging of the pots afterwards, and attention paid to giving methodical syringing, or sprinklings with tepid water over and about the structure. The pots will be full of roots within 15 or 18 days, and will soon make vigorous plants.

The size of the pots for the suckers must be regulated according to their size. Most of the suckers at Bicton are at once placed into pots varying from 7 to 12 inches diameter; and the suckers have, usually, but one shift afterwards. They are not entirely confined to the one shift, but this is regulated by circumstances and seasons. At Bicton there is not the means of commanding a humid warm air sufficient for a bottom heat, therefore they are plunged in a very moderate bottom heat of fermenting materials, such as a little half-decayed tan or leaves placed on faggots: they put forth abundance of roots and grow quickly. Of course they should never at any season of the year be allowed to remain until pot-bound, or the roots in the pots become matted together; but always repot or shift when they require it, no matter what time in the season it may be. No month or season of year is unsuited for this operation.

From growing plants, not intended to be disturbed, suckers cannot with safety be taken till they are grown to the length of 12 or 14 inches, when their bottoms will be brown, hard, woody, and full of small round knobs, which are the rudiments of the roots. It would endanger their breaking if they were to be taken off sooner. When the suckers are taken off, the operation should be preformed with great care, that neither plant nor sucker may be injured. To prevent

which, one hand should be placed at the bottom of the plant to keep it steady; the other as near as possible to the bottom of the sucker; after which, the sucker should be moved two or three times backwards and forwards in a sideway direction, and it will fall off with its bottom entire. Whereas, when a sucker is bent downwards immediately from the plant, it frequently either breaks off in the stem, or splits at the bottom. (*Speechly on the Pine Apple*, 260.)

Some, most erroneously, think it necessary to dry crowns and suckers before potting them, and for that purpose lay them on the shelves, &c. of the stove for a week or ten days. By this treatment, they certainly may be hurt, but cannot be improved, provided they have been fully matured before being taken off from the fruit or stocks, and that these have previously had no water for about ten days. They will succeed as well, or better, if planted the hour they are taken off, as if treated in any other way.

It is quite true that large suckers have been known to vegetate after lying in a hot-house unplanted during the six summer months, but this only proves their tenacity of life. Cut the base of the sucker smooth before planting.

Mr. Mills agrees in recommending the suckers to be planted immediately after separation from the fruit. He says, that planting crowns or suckers of pines in pots, as soon as removed from the parent plants, is

doubtless better than drying them, as is sometimes practised. Pots proportioned to the size of the sucker or crown are best, namely, for small suckers, forty-eights; for ordinary sized suckers, thirty-twos; and for large ones, twenty-fours. It is good, at whatever season this potting is done, to plunge the pots containing the plants into a good lively bottom-heat of, say, 100 degs., with 70 degs. of top heat. Those who require ripe fruit every month in the year, will do well to plant suckers as often, there being on all suckers that are perfect, a quantity of embryo roots formed at the base, so that they may be detached from the parent, without risk, at any season; and if planted as advised, they will make roots freely; and if they do so, in either of the three months of winter, namely, November, December, or January, it will be best to raise the pots a little, so as to let them have at their roots about 80 degs. of heat, and at the top from 55 to 60 degs. of heat, with a good quantity of air; and when they have filled their pots with roots, that is, when the roots are sufficiently extended to prevent the earth falling from them on being turned out of the pots, the plant is in a good state to be placed in a larger pot. It is a bad practice to allow the roots to grow too long against the sides of the pot, as such roots frequently rot when the plant is placed in a larger pot. A pine plant may be shifted into a larger pot, at any season of the year, to its advantage, except during the

three months before named. (*Mills on Pine Apple*, 27.)

The suckers emanating from plants when growing without pots, have nearly double the substance of those produced under the pot system, however well cultivated. Those suckers which are not ripe by the middle of September let remain on the plants which produced them until March following; for they are very apt to rot, not only when taken off very succulent, but likewise if taken off later in the season than September. Each plant generally yields from two to five or six suckers at a time. The season for propagation is according to the time the plants that are in fruit produce the suckers; which is principally in June, July, and August, according as the plants are in forwardness; though the plants will grow at any time. It may however be observed, that they are always fit to be taken off for propagation, when they appear brownish at the bottom; they are to be slipped or drawn off carefully with the hand, (not cut) in a sideways direction. When they are taken off, they should be divested of a few of the lower leaves at the bottom, where they are expected to strike root; where they assume a brown colour at the bottom, and form little knobs, which are the embryos of future roots. These suckers being ripe, having had their full growth on the mother-plant, they should be planted directly into pots (the first size), and plunged into the bark-bed in

the nursery-stove. In cases where there is a want of plants, when the old plant produces ripe fruit, and no suckers from the bottom, as soon as the fruit is cut, trim the leaves of the old stools, giving them freely of water, and it will dispose them soon to send forth several suckers. (*Griffin on Pine Apple*, 35.)

Some persons indeed raise objections against those suckers that are produced late and near the roots, and call them contemptuously underground suckers. But they will produce as fine fruit as any other plants.

Mr. Hamilton's treatment of suckers is as follows :—

Suckers taken off in October, or November, plant into pots, from five-and-a-half to six-and-a-half inches diameter at the top, and plunge over head in the tan : this causes them to strike root in a very short time. In this state let them remain, without any water, except occasionally sprinkling them with the syringe, and this, in the winter season, only in the early part of the day. In March, transplant into pots from seven to eight inches at the top ; and at this shifting, plunge up to their rims, in a heat of about 85 or even 90 degs. for a week or two after potting, to accelerate their striking root into the fresh soil. As soon as plunged, sprinkle them over their leaves with water, two or three degs. warmer than the

atmosphere in the house ; and this mode of watering ought to be repeated twice a day, in the summer season, except in very cloudy weather, when steaming the house will be found to keep the atmosphere and the plants sufficiently moist ; but as the season advances, only water the plants over their leaves in the evening, at the time of closing the house, whilst the sun is still shining on the glass, and before its rays are much diminished. As soon as the heat rises in the tan, give a good watering at their roots, at this season, to settle the soil about them, but after this watering the soil ought to be kept sufficiently moist by watering the plants all over their leaves, every evening, after sunny days. About the latter end of May, again shift into larger pots, but at every one of these shiftings the bed must be replenished with fresh fermenting materials, as a brisk bottom heat is of the greatest importance for two or three weeks, after the plants have been fresh potted. If there is much sun at the time, shade the plants, rather than give much air, for a week or two after potting ; but at all other periods they ought to have plenty of air. The size of the pots, at this shifting, ought to be from nine to ten inches diameter at the top. The plants are every way treated as before, well watered over their leaves, after bright sunny days ; also plenty of water thrown on the pathways, or on the

flues, pipes, &c. If the plants are intended to be turned out into the tan in the autumn, they may thus remain until the bed is ready for them, but if they are to be fruited in pots the following season, they ought to have their last shift early in August. The size of the pots required will be from eleven to twelve inches diameter at the top, and in order to grow the Queen varieties, as well as the Enville, to a large size, they ought to have their last shift ten or twelve months previously to fruiting. (*Hamilton on Pine Apple*, 64.)

On the potting of suckers, Mr. Dodemeade furnishes the following directions:—

He commences potting the strongest suckers early in March, the largest in twenty-four-sized pots, the smaller in thirty-twos, and plunges them in the pit as the potting proceeds, paying strict attention that the bottom heat does not rise too high. He preferred a bottom heat of from 80 to 90 degs., but never exceeding the latter, as he had found, by experience, that 100 degs. was dangerous, and 110 degs. had proved fatal, not only to fresh potted suckers, but to established plants. But little water is given till the roots reach the sides of the pots. As the weather becomes warm and sunny, it is applied more liberally, the water being about 70 degs. On fine sunny days, if the inside of the pit appears dry, a slight sprinkling of tepid water all over the plants and sides of the

pit was found most beneficial, as a moist growing top heat of 80 to 100 degs. will facilitate the rooting and growing of the plants. A slight shading was found necessary on clear days. By the middle of May, if all goes on well, they require shifting, the largest plants into large sixteens, the smallest into twenty-fours, being careful to retain the ball entire. After shifting they are slightly shaded, and the house is kept close for ten days or a fortnight, after which, air is given early in the morning, on fine days, increasing it as the day advances. The thermometer should range from 80 to 90 degs. as it is necessary the plants in this stage should grow at railway speed. He waters with diluted manure-water. (*Gard. Journ.* 1845, 200.)

Crowns.—We never attempt to propagate by crowns, being quite convinced that it is an unnatural mode of propagation, and that if repeated during a series of years the size and excellence of the fruit would be gradually diminished. Plants, raised from crowns, are longer in producing fruit than others raised from suckers, and the fruit is more shallow pipped. Nevertheless, it is a mode frequently practised, and when crowns are employed we recommend that the part by which they were attached to the fruit should be cut quite smooth, and that they be planted immediately. In fact, as has been justly observed—

Crowns may be treated just the same as any other cutting, the base to be cut smooth, with a few of the under leaves picked off; and then to be planted in pots according to their size, and plunged into tan or leaves with a good bottom heat, placing them as near the glass as possible, keeping the pit moist, excluding the air, and shading during sunshine; little water is to be given till they make roots, when they should be gently syringed over the leaves, giving a little at the same time to the roots. (*Gard. Journ.* 1845, 141).

The cutting off the soft end that is twisted out of the fruit, prevents the bottom of the plants from rotting, for it remains to the last in the same state as it was when cut off. If employed for propagation, as the crowns are taken off daily during the fruiting season, as little time should be lost as possible in planting them. There is no necessity to use pots for them, but a hole may be made in the bark two or three inches deep, into which the plants may be put and made fast. When they have been a week or ten days in the bark, they should have a little water once every five or six days; they may be continued in rows, as they come to hand, planting them within three or four inches of each other; and if there are any crowns that are taken off during the winter months, they may be planted in the same manner. (*Griffin on Pine Apple*, 33).

Cuttings of the Stem.—All pine apples may be propagated in this mode, as a bud is formed in the axil of almost every leaf, and in the case of the Providence and other pines, which are shy producers of suckers, it is a mode of propagation often necessarily practised.

For the following directions we are indebted to Mr. Mills :—

Divest the stem of all its leaves, then cut it horizontally into lengths of two or three inches, according as the buds are situated; then split each length longitudinally down its centre, taking care not to injure the embryc plants in the operation; this done, let pots be filled to within two or three inches of their rims with soil well drained, and on this each piece is to be placed on its flat surface, with its buds upwards. The whole surface of the soil may be closely planted in this manner, and then let the slips be covered about one inch deep with heath soil, and receive a gentle watering (they should be kept in a moist state at all times); then the pots containing them should be plunged into a heat of 100 degs. Air will not be required until the plants show themselves above ground, which will be in three or four weeks, when they must have air as other plants. Each piece of the old trunk so divided emits roots freely, and the young plants also, when about two or three inches above the ground. When well rooted, if

to be grown on the pot system, the young plants should be potted singly into forty-eights or thirty-twos, and on good bottom heat, and be near the glass to prevent their being drawn up weak, with a top heat of 65 to 85 degs. during the growing season, with plenty of air and moisture, and occasional shade. (*Mills on Pine Apple*, 72).

SOIL AND MANURES.

It is quite true that the pine apple will root and grow in almost any permeable medium. Mr Hamilton has employed nothing but undecayed tan for the purpose ; Mr. Oldacre was equally successfully with powdered bones alone ; and Mr. Brown, gardener at Merevale Hall, is strongly in favour of peat without any mixture. He says, those who have the good fortune to reside near good peaty soil need not be afraid of using it wholly in which to grow pines. For plants that are to fruit in winter, peat is excellent, on account of its loose texture. Pines planted in a mixture of half charcoal and loam, fruit very well. All sand gives no one cause of complaint ; on the contrary, it should rather be recommended, for the roots become very strong in it, and the rootlets are extremely numerous. It is not of much importance what kind of material pines are grown in, provided the roots are in

a healthy active state, and free from sudden changes of bottom heat. Mr. Brown gives the following as the results to young plants potted in August.

Sort.	Compost.	Description.
Globe	All peat	Grown well ; excellently rooted
Queen	Sandy peat ..	Strong growth ; excellently rooted
W. Providence	Loamy peat ..	Grown well ; and well rooted
Queen	Half sand and loam	Grown tolerably well ; not very well rooted
St. Vincent ..	Peaty loam ..	Of fair growth ; not very well rooted
Queen	All peat	Grown well ; excellently rooted
St. Vincent ..	Half sand and peat	Grown well ; excellently rooted
Queen	Rich loam ..	Excellent growth ; but not so well rooted as those in peat
Queen	Sand and lime	Scarcely made any growth ; and look very yellow.

(*Gard. Chron.* 1841, 503, 765.)

Now this may be, and doubtless is, all perfectly true ; for there is no doubt that, with very assiduous attention to a due temperature, due moisture, and a proper supply of liquid manure, pine apples might be made to grow even in a mass of small shot. But, then, in proportion as the medium employed for them to root in is of a sterile character, must the care attendant upon their cultivation be increased. Such extravagancies may be characterised as the art of growing pine apples with the greatest amount of trouble.

Although it is doubtless true that pine apples can be

grown in almost any pervious innoxious medium, so is it equally certain that there are soils which they prefer, and in which they succeed best and most readily. It is so where they grow wild; for in Brazil the pine-apple is found near the sea-shore; the sand accumulated there in downs serving for its growth, as well as for that of most of the species of the same family. The place where the best pine-apples are cultivated is of a similar nature. In the sandy plains of Praga velha and Praga grande, formed by the receding of the sea, and in which no other plant will thrive, are the spots where the pine-apple thrives best. The cause of this lies evidently in the composition of the sand, which chiefly consists of salt, lime from decomposed shells, and a very little vegetable mould. Warmth, lime, salt, and moisture, seem therefore to be the principal ingredients in which the pine-apple thrives. Sand will take a very high and continued degree of warmth, being often heated by the sun so much as to scorch vegetation, and yet it seldom dries to a greater depth than from 8 to 12 inches. Sea salt is well known for its property of attracting the nocturnal damps, and retaining them a long time. The lime of the shells seems to be the principal manure, which has also been proved by the English in the Brazils, who, by manuring their pine-apples with a mixture of powdered oyster-shells with vegetable earth, produce very large fruit. The natural mould,

usually slightly mixed with sand, is partly of a vegetable and partly of a mineral origin.

The treatment of the plants in Brazil is very simple. As the fruit ripens in January, the young suckers from the roots are taken off in April or May, and planted in the newly cleaned fields at a distance from $1\frac{1}{2}$ to 2 feet from each other, and the strongest of them produce fruit in the following year, seldom weighing above 3 or 4lbs.; but those which do not fruit the second year, grow very large, and their fruit often weighs from 10lbs. to 12lbs.

In the Bahama Islands the pine apple affords still stronger evidence that it is not indifferent as to the soil in which it roots. The Hon. J. C. Lees, writing from New Providence, says, in those islands is a very red soil, in which alone the pine apple will grow. There are two other kinds of soil; one, a very white calcareous soil, consisting of chiefly finely pulverized Madrepore limestone, in which the maize or Indian corn grows remarkably well; and the other, a deep black soil, almost entirely vegetable, and very light, in which many things grow luxuriantly, but in neither of them will the pine apple grow at all. The red soil does not, as far as pines are concerned, appear to be improved by manure. Mr. Lees planted several in the same bed, some without manure, and others with different proportions of stable-manure; between those in the natural soil and those slightly manured, he

could perceive no difference ; but beyond this, in proportion to the quantity of manure, so did the plants decline and turn white. He tried plants in composts of charcoal and manure, and of charcoal, earth (calcareous,) and guano, but without success ; nothing seeming to suit them here but their favourite red soil. Mr. Solly examined this soil, and says it is free from stones ; and though it appears to consist in great part of a coarse ferruginous sand, on examination is found to contain no sand, being easily rubbed to an impalpable powder in a mortar, and showing no grittiness under the pestle. A portion of the soil, freed from the larger fragments of wood, roots, and bark, which it contained, gave an analysis of the following composition, in ten thousand parts :—

Silica	..	..	..	3090
Alumina	..	..	..	2400
Oxide of iron	..	..	..	1832
Lime (chiefly as carbonate)	..	..	..	132
Magnesia	..	..	..	8
Potash in a soluble state	..	..	..	5
Potash combined with earthy matter	..	..	}	20
Phosphate of iron	..	..	..	9
Sulphuric acid	.	..	..	2
Chlorine	..	..	..	4
Ammonia	..	..	..	a trace
Organic matter	..	..	..	990
Water	..	..	..	1508
				<hr/>
				10,000

The soil is chiefly remarkable for the usually large proportion of oxide of iron which it contains, but in the absence of an analysis of the pine apple plant, no very accurate conclusion can be drawn as to the peculiar excellence of this earth for its cultivation. (*Hort. Soc. Journ.* i. 126.)

We find that in this country the best soil for the pine apple is a rough turfy loam, well sweetened and broken down. We prefer, above all, a heathy turf, with the roots and its natural vegetation all with it; never breaking it until at the potting bench, as the process of potting is going on. Then we break the sods, which are mostly chosen about two or three inches in thickness, in such kind of pieces as we can thrust into the pots, putting in, as we proceed, some pieces of charcoal, always taking care to drain the pots carefully, which is one of the chief essentials. Our drainage is principally coarse charcoal, averaging one-fourth of broken rubby potsherds, which are placed first round about the bottom; then, if it is a seven-inch pot, for a sucker, the drainage averages two inches at least; and if fifteen or eighteen-inch pots, which are the largest fruiting pots we make use of, the drainage is employed in a coarser state, and about two inches more of it, and the soil too is thrust into the pots rougher—brambles, furze, heath, and grass, altogether—with no other kind of manure, besides an occasional lump or handful of rubby

charcoal, merely to fill up some of the crevices. *It is not rammed*, that is to say, not *pounded*, or jammed together in the same way potting is too often done, but pushed down as we proceed, quietly. Thus the soil is really a whole body of drainage—there is no obstruction either to the atmosphere or the water. (*Johnson's Modern Gard. Dict.*)

At Bicton the following mode of preparing the soil for pine apples from the top turfy spit of a common is adopted by Mr. Barnes. In dry weather during summer, a naturally well drained part of the common is selected, and the top layer is cut from it with all its native herbage by means of a turf mattock. This turf is turned upside down, with the soil side to the influence of the sun and atmosphere for some days until dry; it is then packed in cocks, as poor people would turf to burn, to secure it from rain, and then carted home as quickly as possible, and placed on a foundation of rough wood to the width of 4 feet, placing a quantity of rough wood between it as it is stacked, to prevent its fermentation, or the breeding of fungi, and to insure its entire healthiness until required for use. It is stacked 5 or 6 feet in height, being finished off in the form of a ridged or pitched roof, which is at once thatched. To insure looseness of texture, as every turf is taken from the stack for use, a hard blow or two is given to it on the soil side. This is done with a heavy piece of wood of 2 inches

diameter and about 2 feet in length, called at Bicton "the potting bench batten." The porosity thus secured, is of more consequence than may appear at first sight to some, who may imagine it a new-fangled system.

That a turfy loam is the best possible principle ingredient in pine apple soil, has been admitted ever since its cultivation attracted notice in this country. It is so laid down by nearly all writers upon the subject, but as they generally offer some instructive hints, we shall concentrate their directions pretty much in the order of time in which they appeared, warning our readers, however, against adopting those composts in which rich manures are prominently employed.

Mr. Giles, next to *Mr. Justice*, the earliest original writer in England on this fruit, says that the soil should be a rich hazely loam, taken from a well-pastured common, or what is called virgin-earth. Notwithstanding the directions given by several authors to make compositions of various soils, this answers much better, not only for pine-apple plants but for most other vegetables. (*Giles on Ananas*, 13.)

Mr. Taylor recommends one load of mould from under the turf of a good pasture, and, if it be very light, the fourth part of a load of good mellow loam to be added to it. But, if it be itself of a loamy nature, to mix with it two or three bushels of sea-sand. Then take the fourth part of a load of dung

from a cow-yard, but, if not procurable, take the same quantity of good rotten dung from an old cucumber or melon bed. Mix these well together, and turn the whole three or four times. All the large clods should be well broken, but not sifted or screened. (*Taylor on the Pine Apple*, 14.)

Mr. Speechley, writing a few years later, says, in the month of April or May, let the swarth or turf of a pasture, where the soil is a strong rich loam, and of a reddish colour, be pared off, not more than two inches thick: let it then be carried to the pens in sheep-pastures, where sheep are frequently folded, which places should be cleared of stones, &c. and made smooth; then let the turf be laid, with the grass side downwards, and only one course thick; here it may continue two, three, or more months, during which time it should be turned with a spade once or twice, according as the pen is more or less frequented by the above animals, who, with their urine and dung, will enrich the turf to a great degree, and their feet will reduce it, and prevent any weeds from growing. After the turf has laid till the quantity of sheep's dung constitutes nearly one-third part, it should be brought to a convenient place, and laid in a heap for at least six months, (if a twelvemonth, it will be the better,) being frequently turned during that time; and after being made pretty fine with a spade, but not screened, it will be fit for use. In places where

the above mode cannot be adopted, the mixture may be made by putting a quantity of sheep's or deer's dung and turf together. But here it must be observed, that the dung should be collected from the pastures when newly fallen; also, that a larger proportion should be added, making an allowance for the want of urine. 1. Three wheelbarrows of the above reduced swarth or soil, one barrow of vegetable mould from decayed leaves, and half a barrow of coarse sand, make a compost mould for crowns, suckers, and young plants. 2. Three wheelbarrows of swarth reduced as above, two barrows of vegetable mould, one barrow of coarse sand, and one-fourth of a barrow of soot, make a compost mould for fruiting plants. (*Speechley on the Pine Apple*, 279.)

Mr. Griffin, writing in 1808, recommends the following compost:—4 wheelbarrows of brown light pasture loam, 1 barrow of sheep's dung, and 2 barrows of swine's dung. He says that this composition, carefully and properly prepared, will answer for the growth of pine plants of every age and kind. It should be well mixed, and broken small with a bark fork, so as to be well incorporated, and should be fully exposed to the sun, air, rains, frosts, &c. to meliorate. It should be formed in a heap, not large and high, but extended in length like a ridge, about four or five feet thick. Once every two or three months, at least, it ought to be turned over, and the

bottom thrown to the top, that all the parts may be well mixed. This is so peculiarly essential, that if the heap be not thus exposed, the compost would be far from effecting the proposed advantage to the plants. It is necessary that the above compost should remain a year in this heap or ridge. When you make use of this compost, it is not advisable to screen it for the pine plant, unless there are stones in it; but, in a general way, the soil should only be broken fine with the spade and hands; for, when fine screened or sifted, it becomes too compact for the roots of the plants. (*Griffin on Pine Apple*, 23).

Mr. Baldwin, who wrote in 1818, directs the pine cultivator to strip off the turf from old pasture or meadow ground, and dig to the depth of six or eight inches, according to the goodness of the soil, draw the whole together to some convenient place, and mix it with one-half good rotten dung, frequently turn it over for twelve months, and it will be fit for use. This is the only compost either for young or old plants. (*Baldwin on Pine Apple*).

Mr. Glendinning recommends a compost formed of turfy loam, of mould and fresh deer or sheep dung, forming them into a square heap in layers, putting three barrows of dung to six of loam and one of leaf or vegetable mould, and continuing to put the one after the other, until the heap is three feet high. No other preparation will be necessary, as it will be

fit for use in three or four months, when, with a sharp spade, it must be cut through the heap perpendicularly, and the largest pieces again chopped. (*Glendinning on Pine Apple*, 20).

The soil *Mr. Mills* uses for pot culture is three-fourths strong loam and heath soil in equal quantities, and one-fourth fresh droppings of horses, kept dry in a shed, and mixed with the soil when required for use. The heath soil and loam are also used fresh and in a rough state, the grass only being picked out of them during the process of chopping; and about two inches thick of the surface of each. (*Mills on Pine Apple*, 45).

Mr. Hamilton says, let the turf be stripped off an old pasture to the depth of two or three inches, and add one-third of well decomposed dung from the stable yard, or from an old hotbed; to this may be added one tenth part of wood ashes. Let the whole be piled up in a ridge, and in a few weeks it will be fit for use. To those who have not these at hand, and are in immediate want of soil, the following may be used with great success:—Prepare a tank of liquid manure, into which throw your turf, and let it steep a few days or weeks if not wanted; then take it out and dry it under a shed, after which chop it with a spade, and it will be fit for use. (*Hamilton on Pine Apple*, 58).

Mr. Dodemeade says that the soil he uses for fruit-

ing plants is one-half loam, of a free fibrous nature, one-half fowl's and sheep's-dung, well incorporated. On Norwood loam, so highly thought of by some pine-growers in its vicinity, Mr. Dodemeade observes, that he had been told that no admixture of other matters with it was necessary; but if this statement was good in theory, it is denied in practice. Even the pine plants bear contrary evidence; grown entirely in this loam, they always appear of a yellowish green and of a stunted growth, indicating a want of stimulating matter. According to his own experience, Norwood loam only possessed one good quality favourable to pine-growing, viz., its soft unctuous nature rendering it open and free for the escape of water, and preventing it from binding hard, or cracking when used for potting; but unless stimulating substances are adopted for the plants to subsist on, and to feed the fruit, a person, he thinks, might as well expect to see an apple change to an orange as to cut a 4lb. Queen pine grown entirely in this soil. Then, again, the composition of this loam differs according to the situation whence it is dug, as is shewn by the following analyses of two, one known as Hamilton's loam, and the other the Woodman's Field loam:—

HAMILTON'S.		WOODMAN'S FIELD.	
500 grains of this soil contain—	GR.	500 grains of this soil contain—	GR.
Water of absorption	21	Water of absorption	32
Finely divided matter by filtration, principally alumina	72	Finely divided matter by filtration (alumina)	16
Coarse alumina & sand	370	Soluble matter (alumina)	1½
Soluble matter, mostly alumina	3	Alumina and sand	410
Carbonate of lime	2	Carbonate of lime	5
Oxide of iron	7	Oxide of iron	6
Loss	25	Loss	29½
Total	500	Total	500

Although these fields joined, there is this striking difference in their component parts : Hamilton's loam is less retentive of water, but contains a larger amount of alumina (clay) ; that of the Woodman, less soluble matter by half, but of coarse clay and sand a considerably larger quantity ; also a larger portion of lime, with less amount of iron. The balance was pretty equal as to their respective worth for pot use ; if any difference, in favour of the Woodman, as regards lime and the retention of water ; and that of Hamilton in the amount of soluble matter by filtration ; but in neither was there any trace of vegetable matter : hence, when used simple, the cause of pine plants grown in it being sickly and yellow. The soil Mr. Dodemeade finds most adapted for suckers and crowns consisted of equal parts of good mellow loam

and decomposed leaf mould. For succession plants he uses one-half good turfy loam and one-half leaf mould, decomposed cows' and fowls' dung well incorporated together. (*Gard. Chron.* 1845, 200.)

The practice of *Mr. Oldacre*, well known as gardener to the late Sir Joseph Banks, was very eccentric. At first, he used good sound loam and dung, with a little sand, when he found it necessary; but at the close of his life he grew his fruiting plants chiefly in powdered bones, in which he thought they throve better, and produced more highly-flavoured fruit. *Mr. Loudon*, however, was not able to discover any thing, in the appearance of either fruit or plants, to lead him to suppose that powdered bones are more congenial to the pine plant than good loam and dung; his plants were certainly not equal to *Mr. Baldwin's*, nor superior to those grown by *Mr. Andrews*, or *Mr. Aiton*. He, therefore, considered their thriving in this compost a proof more of the hardy nature of the pine, than of any thing else; and he had no doubt it would grow in powdered granite, or coal, or almost any powder, not even excepting gunpowder, if a due proportion of well rotted manure were added, and water, heat, light, and air, duly supplied. (*Loudon on Pine Apple*, 135.)

These opinions are coincident with our own, already expressed, and we will add here, having given the directions of those in favour of richer composts than

we employ, that it is a bad practice to form heaps of composts for any kind of plant culture, but particularly for the pine apple. Composts thus heaped together are apt to degenerate from the real healthy condition they were in when collected, and to become altogether different in quality and influence upon the plants. By the admixture they often become adhesive and compact, soured by fermentation, and the nursery of insects and fungi of various kinds. It is injurious, therefore, rather than beneficial to hoard up soils for a length of time, or mix composts long previously to their being made use of: for the chief consequences are to lose time and alter their most valuable properties. Liquid manure, when applied by the old school of cultivators, was generally a composition of several articles, recommended to be used only after it had received so many stirrings, and had been allowed to stand so many weeks or months, which just amounts to absurdity, and loss of time and of fertilizing power; besides, it never was recommended to be applied in a clarified state, as nature applied it, but as a thick mixture admirably adapted to closing the pores of the earth, under the old finely-broken soil system of potting pines, besides causing a very unsightly appearance on the surface of the soil.

The best liquid manure for pine plants in all stages of growth is made by adding one gallon of soot, one bushel of cow's, deer's, or sheep's dung, with a quar-

ter of a bushel of quicklime, into one hogshead of water ; stir it well at the time of mashing ; then once a day, for three or four days, strain it off into another cask, and drop another quarter of a bushel of quicklime into it, and it will very readily clarify. Of this, add one gallon to every two of soft water for applying to fruiting and fruited pines, always in a tepid state. For plants not in a strong growing condition, one gallon to three of water is sufficient. Always apply a small portion, at all seasons, to all pine plants in any stage that requires moisture, either by syringing over their leaves or by application to their roots, not at all confining them to clear water alone.

Growing in Moss.—As a further proof that Mr. Loudon and ourselves are right in thinking that the pine apple, with due cultivation, may be made to thrive in any medium unfertile to its roots, we will give the details furnished by M. J. Seimel, head gardener to Count Montgelas, at Bogenhausen, near Munich. Instead of soil he uses moss for the pine apples to root in.

Gathering the Moss, its Treatment and Mixing.—The moss (*Hypnum spec. div.*) is gathered in the months of September and October in the woods, and chopped small at home with a hatchet, or cut like chaff, after which it is laid up in a broad heap in the open air. About four English bushels of horn shavings, or more, are added to every two-horse-load of moss, and well mixed with it ; after that the heap is

left undisturbed till the following spring. In the first fine days of March, the moss thus mixed is spread in the air, in order to get it tolerably (but not thoroughly) dry; after which it is put under cover to prevent its getting damp again.

Transplanting the Pine Apples without Balls.—The pots are chosen in proportion to the size of the plants, but they are generally larger than when the plants are to be potted in earth. The apertures at the bottom are, as usual, covered with bits of earthenware, after which the pots are filled in the following manner:—First put in the prepared moss to the depth of three fingers, which is well rammed down, and then thinly covered with manure and salt, or saltpetre. This is continued alternately till the pot is rather more than half full; after which a cylindrical piece of wood, of from 2 to 3 inches in diameter (according to the stoutness of the plant), is placed upright on the moss in the pot, and the latter is then filled to the top with the same substance, with thin sprinklings of salt between the layers as before. The wood is then taken out, and the hole partially filled up with fine good mould. The number of pots thus prepared must be the same as that of the roots to be transplanted. (*Gard. Mag.* vi. 705.)

Pine apples grown in moss are not so sensitive as those which are grown in earth, and bear watering better. In the month of March put into a cask,

holding about two hogsheads, two bushels of cow-dung, one peck of horn shavings, and from 20 to 24 quarts of bullock's blood, filling the remaining space with water; and leave it for three or four months to a voluntary fermentation, causing the liquid to be well stirred up about once every week.

Use of the Liquid.—At the end of those three or four months the fermentation will have been completed, and the liquid may be applied to the pine apples towards the end of May or the beginning of June, and again in September and October, under the following regulations: When the moss in the pots has got properly dry, water the plants copiously with this liquid stirred up, and afterwards each plant with clean water, in order to distribute the former equally among the pots. Only use the liquid once, employing water at other times. Use this liquid again in September or October, also for once only, and then again use pure water. (*Ibid.*)

Manures.—These have been mentioned incidentally, whilst descanting upon the soil to be employed. If this be duly attended to, a little liquid manure will be the only fertilizer required. This is formed by adding a peck of fresh sheep's or deer's dung to 30 gallons of water, and allowing it to stand until quite clear. This may be given to all rooted plants once or twice a week; the stronger and more vigorous the plants the oftener may the liquid be given them

—they require and can elaborate perfectly more nourishment than weakly plants.

Mr. Glendinning, writing on this mode of fertilizing, says, that in order that a stock of liquid manure may be always on hand, it will be necessary to have at least a couple of vats, or tanks, each holding one, two, or three hogsheads, according to the number of plants cultivated; and that the liquid may be in a fit condition for use, it will be important to renew the one most exhausted every five or six weeks. Collect some fresh sheep or deer's dung, and fill a two hogshead vat about half full; then add about a peck of unslaked lime, and about the same quantity of soot; then fill the vat up with water; this must be kept well stirred every other day for a month, when it will be fit for use. When wanted, take an empty tub, and place a small meshed sieve over it; well stir the composition, and then pass it through the sieve. The inspissated quality of this manure will require some modification, so as to enable it to escape freely through the tube of a small watering-pot; water must therefore be added, until it is sufficiently attenuated to allow its so doing. When thus diluted, great care ought to be taken, in its application, not to let it fall on the leaves of the plants; to prevent this, some simple contrivance will be necessary, such as a funnel soldered on the end of a long tin tube, into which the liquid can be poured; or a tube made to screw on the spout of a small water-

ing-pot, which will enable the operator to apply it immediately to the root of each plant, and thus avoid the unsightly appearance which they would have, were the foliage carelessly sprinkled with the liquid manure. (*Glendinning on Pine Apple*, 36.)

The liquid manure we employ is already described in a previous page.

Soot is recommended by Mr. Alexander, gardener at Carlton gardens, to be mixed regularly in the soil for pines. He says it is an excellent stimulant for giving those plants a dark green and healthy appearance. Used in the following proportions for fruiting plants: four wheelbarrows of friable turfy loam, cut three or four inches deep from a common or old pasture, at least one year old before using it, and to be turned and chopped two or three times during that period; one barrowfull of sheep's droppings gathered fresh from a common, and dried upon mats in an open shed, or out of doors, as the weather suited, and pounded fine with a quarter of a barrowfull of soot. The whole well mixed together, but not sifted, a week or two before being used. For succession plants, add two barrowfulls of leaf-mould to the same proportions. (*Gard. Chron.* 1843, 266.)

Soot, as a manure for pines, when used fresh, is also excellent for preventing worms from entering the pots: but the drainage must be good, otherwise it will soon lose its volatility. If strewed over the crocks to the depth of a quarter of an inch, it will answer the above

purpose; the roots of the plants will grow freely in it, and their extremities will have a clear white and healthy appearance.

Salt.—In some districts near the sea, as in Brazil, and on soils not only strongly impregnated with salt, but actually flooded occasionally with sea water, pine apples grow to an enormous size. Hence, it is reasonable to infer that salt is assistant to the health and growth of this fruit, and we hope cultivators will try some experiments to confirm or refute this inference.

PITS AND STOVES.

WHEN pine apples are required all the year round, it is especially desirable that there should be two structures devoted to their cultivation; because, to obtain them in perfection, they must have a period of rest, and this can only be given to them in a temperature much below that in which their fruit is ripened. Moreover, Mr. Glendinning is right in observing that the pine plant in its younger stage, if supplied with the same degree of heat and moisture requisite to mature the fruit, has its foliage drawn, and the whole plant so constitutionally weakened, that nothing but disappointment would follow, the fruit of such plants being invariably puny.

In the winter months it is also desirable to keep the young plants comparatively at rest, and this requires a

lowness of temperature not sufficient for ripening the fruit. At the same time, we must observe that, it is quite possible to make the structure we are about to describe quite efficient for cultivating the pine throughout every stage of its growth, if just attention be paid to ventilation.

Opinions amongst practical men vary respecting a fruiting pine structure, and we must acknowledge that, up to this time, we have not seen the kind of structure which we should like to have for this most essential part of pine culture. For convenience in watering, staking, removing plants, taking off suckers, and economy throughout, supposing a pit was erected 8 feet in width, in the clear between the back and front wall inside, this space would hold 4 rows of first-rate plants; the length, of course, must be regulated according to the number of plants to be fruited each season. If the entire pit be in length 100 feet, divided into four 25 feet compartments, each would hold 50 first-rate plants; by this means, of course, each compartment could be regulated as required at all seasons with heat, air, water, &c. &c., thus ensuring that great point, a succession of fruit. The walls of the pit should be of 9-inch work, but hollow, and tied together, of course, in places with a cross brick or bond timber. Throughout such a pit we would have a tank or gutter introduced for furnishing the required bottom heat and humidity, and such tank or

gutter we would cover over with slate or galvanised iron closely, and on it have placed a good portion of charcoal in a rough porous state ; over this, or rather up the centre, we would have a pipe run, with small perforations thickly on each side, for turning on clear water, or water charged with ammonia clarified, when requisite, for damping the whole surface of charcoal, tank or gutter, to charge the interior with humidity at any time when required. Over this we would erect a platform on two rows of piers, by carrying across galvanised iron bearers, each end of course to take a bearing also, on both back and front walls, and a cavity left between the top of the tank or gutter and the bottom of the platform. This cavity should not be less than from 2 feet to 2 feet 6 inches high ; 3 feet would be all the better ; first, because the air would not be liable so soon to become stagnant ; secondly, because trap doors or ventilators could be placed to admit persons to clean out the chamber between the platform and surface of the tank, examine the whole, and replenish the charcoal and other requisites readily at any time ; and thirdly, it would be an advantage to have ventilators to admit with care the exterior air into the air chamber for circulation over the whole structure. The bottom or sides of the platform should be constructed with $\frac{3}{4}$ or 1-inch rods of galvanised iron. We say the sides, because our plan would be to have a cavity left all

round the outside of the platform, to the width of 3 inches, to admit of a free circulation of heated air and humidity just when considered necessary, by turning up the narrow ventilators, which should be placed over the outside cavity, and made also with galvanised iron, and hung upon hinges in about three lengths at the front or back of each compartment. The depth of the platform need not be more than 16 or 18 inches; if the latter, it would admit of 3 inches of rough charred materials placed upon the bottom; here the fruiting plants could either be turned out in a proper, or what may be considered a suitable preparation, or plunged in their pots. Possibly some practical men may imagine, were they to turn out plants into such a structure, they would like a greater depth of soil; but Mr. Barnes considers such a depth of suitable soil and drainage is quite sufficient, as it would readily allow a free circulation of air, water, and humidity, and would not be so likely to become soured as a greater depth would; and it is certainly a sufficient depth for placing the potted plants in, which should be entirely filled up between with charred vegetable matters in a rough rubbly condition.

A four-inch flow and return hot water pipe should pass along the whole length at front of the pit; and the best known method adopted for giving air and covering, keeping economy as well as efficiency in view.

We do not strictly confine our recommendation to the width mentioned, but it is a convenient width for the reasons named, and rendering each plant easily seen and come-at-able, and the lights are of a convenient length. The depth of the space between the summit of the platform and glass, should be about 4 feet 6 inches, as it is best at all seasons to have the plants near the glass, and the ventilation could be given to them in hot weather at both back and front, or entirely at front to any extent, which would considerably alter the angle of the structure and the power of the sun. This is a system we always practise for a few hours in the very hottest part of the day, which is far preferable to shading. Shading Mr. Barnes never practises, except for a few days slightly for fresh potted suckers, and plants fresh shifted for a day or two, if the weather happens to be fervent, for he considers it against all reason to practise shading to the extent some gardeners do in this comparatively sunless country.

Where fermenting materials are abundant, and their unsightliness not objectionable, they could also be made use of with considerable benefit, by constructing the outside four-inch walls with pigeon holes, and leaving two or three rows of plug holes in the inside wall, to be opened or stopped when desired. The gasses from kindly worked fermenting materials, says Mr. Barnes, are not to be despised in pine cul-

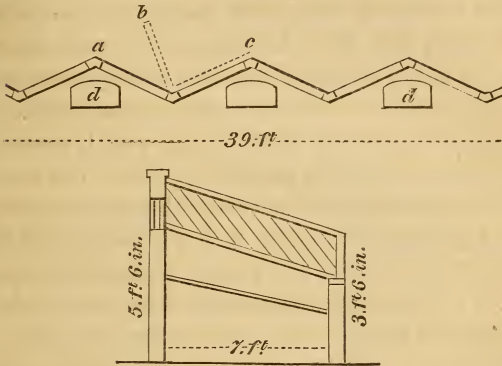
ture, for they have no mean influence, and if well managed, there would be certain parts of the seasons when both tank and pipe heat could readily be dispensed with, or either one or the other, according to circumstances; it would be a grand point to have the full command when requisite of the whole, and if well managed, would grow pine plants and swell their fruit to an extent beyond all previous attainment. Of course such application of fermented materials could be confined out of sight, by building an outside wall or sinking a trench, if the pit or structure is a sunk one, (which is a practice we do not approve,) and it could readily be covered with shutters, which would form a platform to walk on to get at the pit more conveniently from the outside.

All the pitch that is necessary in the roof of a pine pit is just what is sufficient to throw off the rain-water that falls upon it. It is known that the pine apple plant luxuriates in a moist atmosphere; and, if that fact is admitted, there then can be no doubt as to a flat roof being the most conducive to produce that effect. On the contrary, if a dry atmosphere be required, by all means have the pitch or angle of your glass roof as much greater as is convenient, as there cannot be a doubt that the greater the angle of the glass roof is the greater will be the heat collected from the rays of the sun, and consequently the more arid the atmosphere. (*Mills on Pine Apple*, 4.)

Although we are in favour of hot water in pipes combined with fermenting materials as the best practical mode of heating structures devoted to the culture of the pine apple, yet various other modes have been proposed, from each of which we have selected that one which we consider the most preferable example.

Heat from Dung and other Fermenting matters.— This is the cheapest mode of heating, and, if combined with the following arrangement of the glass, proposed by that accomplished horticulturist Mr. Paxton, forms by far the most economical structure for pine-culture that has been devised hitherto. He directs the pits to be constructed of nine-inch brick on bed, 78 feet long inside and 7 feet wide being a good size. Cover the pit with a ridge and furrow roof, making the space from the ground in front of the pit to the valley-rafter 3 feet 6 inches, and the back wall below the rafter 5 feet 6 inches. Divide the whole length into four compartments, for growing the different sorts of plants, by $4\frac{1}{2}$ -inch brick-on-bed walls. Divide the whole length of the ridge and furrow-roof into 12 bays, having a ventilator in the angle of each pediment, as at *d d*. Now, to get to the plants, each light is hinged at the valley-rafter, and fastened with a thumb-button at the ridge-rafter. By referring to the following figure it will be seen that the light or frame leaves the ridge-rafter at *a*, in the direction of *b*, and lies flat upon the next light at *c*. Each

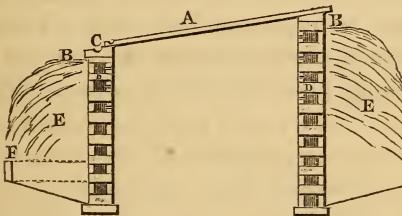
light may be opened in this way, so that a workman may get to any part of the pit. (*Gard. Chron.* 1844, 69.)



Mr. Knight's pit was also heated by dung heat only, but applied by means of linings. It was constructed of a hollow wall, nine inches thick, with sound, even-sized bricks, placed edgeways, the joints being carefully made, and laid with the very best mortar. The bricks placed with their faces and ends alternately to the outside, so that those which have their ends exposed become ties to the surfaces of the wall. In each succeeding course, as the wall is built, the bricks with their ends outwards are placed on the centre of the bricks which are laid lengthways in the course below. Thus a hollow space is formed in the middle of the wall, of four inches in width, which is

only interrupted where the tying bricks cross it, but there is a free passage for air from top to bottom of the wall. The front wall is four feet, and the back wall five feet six inches high, enclosing a space of six feet wide and fifteen feet long, and the walls are covered with a wall-plate, and with sliding lights, as in ordinary beds. The space enclosed may be filled to a proper depth with leaves, or tan, when it is wished to promote the rapid growth of plants. The wall is externally surrounded by a hotbed composed of leaves and horse-dung, by which it is kept warm; and the warm air contained in its cavity is permitted to pass into the enclosed space through many small perforations in the bricks. At each of the lower corners is a passage, which extends along the surface of the ground, under the fermenting material, and communicates with the cavity of the wall, into which it admits the external air to occupy the place of that which has become warm and passed into the pit. The entrances into these passages are furnished with grates, to prevent the ingress of vermin of every kind. The hotbed is moved and renewed in small successive portions, so that the temperature may be permanently preserved, the ground being made to ascend a little towards the wall on every side, that the bed in shrinking may rather fall towards than from the walls. The perforations in the interior of the wall are from 18 to nearly 20 inches distant from

each other, and they do not begin till the fifth row of bricks from the bottom. When the pit is intended for early cucumbers or melons, and the lower part is consequently to be filled with leaves or tan, the holes in the bricks should only be made above the surface of whatever may be put into the pit, or, if previously made low, must be closed.



A, sliding lights; B B, wall plates; C, water-groove; D, Hollow wall; E, dung linings; F, air funnel. (*Knight's Papers*, 262.)

Mr. J. Macnaughten employs pits heated by tan, and obtains additional warmth, when required, by the aid of dung linings.

The pit is $18\frac{1}{2}$ feet long, by 6 feet in breadth; the height of the back is 5 feet; the height of the front 3 feet 9 inches; the declivity for the glass 1 foot 3 inches. The pits for the dung are on the outside of the frames, and sunk level with the surface of the earth, or gravel, on the outside. The height of these pits is 3 feet, their breadth 2 feet. The outside of

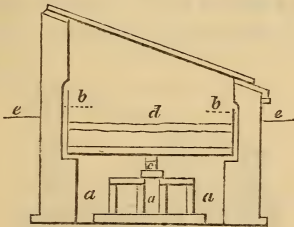
the pits for the dung is built with 9-inch wall up to the surface, with one course of heuri stone on the top. One inch is cut out for the boards that cover the space allotted for the linings to rest upon: that appearance of litter and dung, which is so offensive in ordinary hotbeds, is thus prevented. The boards that cover the dung are 1 inch thick, by 2 feet 2 inches in breadth. They are of the length of the pit, and have rings at each end for lifting them with. The pits should be well drained, to carry off the under water, and a small grate should be made at the end of them. The kind



of matter which is generally employed to fill the pits, is a mixture of new horse and cow dung: sometimes tree-leaves and short grass are used, which do very well, provided they be duly prepared, by throwing them up in a high heap, to remain eight or ten days, that they may ferment to an equal temperature. Let the heap be turned over once in the time. By mixing the parts together they will work kindly when shaken into the pits. The heat will be steady and lasting, at least for a month. If the heat begins to decrease much, let a part, or the whole, of the dung in the back or

front be thrown out and shaken back again, with a little addition of new horse dung, and it will continue as long again; only, let the pits be always kept full up to the boards, and let only one side be shifted at a time, allowing fourteen days between shifting each side of the pits. The inside of the pit is filled up to within three feet of the glass, with tanner's bark, well dried; for drying is a material thing to be attended to in the winter season. Care must be taken not to let any of the bark fall into the flue, or vacant space that is left for the heat to come up. (*Caled. Hort. Mem.* iii. 336.)

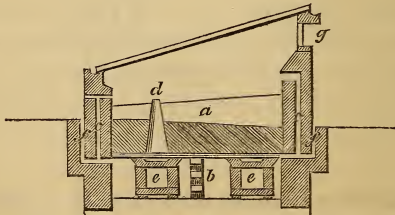
Fire heat direct.—Mr. Stewart, gardener to Sir R. Preston, at Valleyfield, near Culross, Perthshire, erected a pit in which he built two flues (*a, a,*) and



supported over them, on brick props (*c*), a flooring of pavement, covered with layers of gravel and sand (*d*), on which he placed the pots; at the sides were openings (*b, b,*) to admit the heated air from below to

warm the atmosphere of the plants ; the upper level of the platform on which the plants stand is nearly on a level with the external surface (*e, e,*). The pots of plants are set on the sand, so that when moisture is added either to it or to the plants, it causes a fine gentle steam to arise through the whole of the pit, which can be regulated at pleasure, by adding more or less fire, according to the season or other circumstances. The temperature kept during the spring and summer season is from eighty to a hundred degrees through the day, and as low as from sixty-five to sixty degrees during the night ; in the autumn and winter it is as low as fifty-five or fifty degrees. (*Hort. Soc. Trans. v.*)

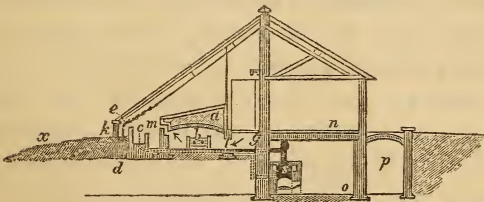
Fire heat and Fermenting materials.—A pine pit erected in the garden of W. Forman, Esq., is heated by a flue in a chamber below the tan. The tan (*a.*)

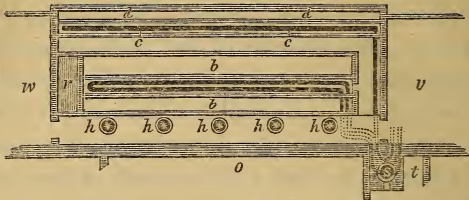


is supported by oak joints resting on the side walls, and on a middle wall of open brickwork (*b*). The

joists are three inches deep, an inch and a half thick, and three inches apart ; instead of being covered with boards or tiles, a course of turf is laid over them, which is found to answer perfectly. The heated air is conveyed from the chamber below into the atmosphere of the plants, by means of small apertures (*e*,) formed in the back and front walls at four inches and a half apart, and also through tubes of iron, or chimney-pots (*d*), resting on the joists directly over the flue. Through the same pipes or pots water may be poured on the covers of the flues, which are formed hollow (*e*), so as to generate steam at pleasure. Ventilation is effected by air-holes (*f*,) communicating with the pit, and by sliding shutters in the back wall (*g*). (*Hort. Soc. Trans.* vii. 88.)

Hot water in Pipes.—The following plan is suggested by Mr. W. Henderson, of Walton Nursery, near Liverpool.





a, bed to plunge or plant out in; *b b*, hot air chamber; *c c*, gutter with pipes supplying heat to the atmosphere; *d d*, area where vines are planted and laid down during the season of rest; *e*, a closely fitted shutter is fixed here while the vines are laid down; *f* and *g* show an offset in brickwork which carry the back footpath; *h h h*, register gratings to regulate air to chamber (*b*); *k*, ventilators in front wall, regulated to admit or shut out air from the area (*d*); *b*, descending air cavity; *m*, ascending air cavity; *n*, floor of potting shed; *o*, cellar or root store; *p*, passage to ditto, which is an open area except where an arch crosses, forming entrance to potting shed (*n*); *r*, tank for water from the roof; *s*, boiler; *t*, stoke hole; *v*, a viney; *w*, a plant house; *x*, a surface of vine borders. The pipes being laid in the gutters (*c*) will readily suggest the facility with which the atmosphere may be charged with moisture; or, on the contrary, when a dry heat is desired, the water has only to be withdrawn from

one or either of the gutters just as may be deemed proper. The bottom heat to the plunging or planting out bed (*a*) is communicated through the brick arch from chamber (*b*). Brickwork is found to be by far the best medium, the porous material being a good conductor, as well as a guarantee that no accident can happen from over-heating the roots, while no difficulty will be found in raising the temperature of the tan or soil in the bed to 75 or even 80 degs. The pipes laid in gutter (*c*) are for supplying the necessary heat to the atmosphere of the house, and of course can be worked from the same boiler with, or independent of, the pipes in the chamber (*b*). You will at once comprehend that a rotary motion is given to the air in the house, a syphon action being formed by admitting the heavier, viz. the cooled, air at the register gratings (*h h h*), through the aperture (*b*), which, displacing the heated air in the chamber, escapes through the higher cavity (*m*); thus a constant circulation is kept up. (*Gardener's Journ.* 1845, 185.)

Another pine stove, heated by hot water in pipes, is at Bamford Hall, Rochdale, and is thus described by Mr. Cherry, its superintending gardener:—It is unequally span-roofed, the front rafters being 11 feet long and the back ones 6 feet. Its length is 25 feet, and its breadth 15 feet, having a walk 3 feet wide round the interior. It is fitted up with a shelf at

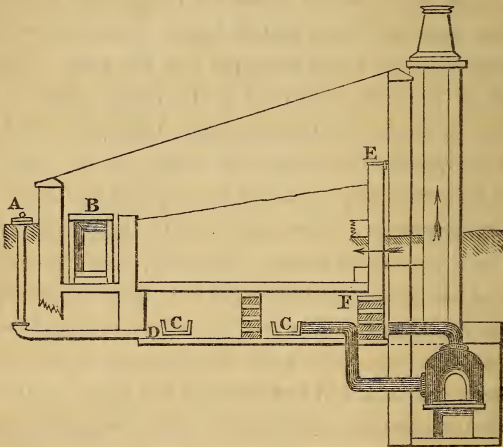
the back, 3 feet from the glass, and with another in front, 5 feet from the glass. The front of the house is 6 feet high above the walk, and the upper portion is glazed to the depth of 4 feet. At both ends of the house there is a flight of 6 steps from the front walk to the back one, which is on a level with the front of the pit. The latter stands in the centre of the house, its slope corresponding with that of the roof; but instead of being heated by bark in the ordinary manner, the roots of the plants are warmed by means of hot water pipes passing beneath them. For this purpose the pit is surmounted by a boarded stage, containing 4 shelves, with openings in them to receive the pine pots up to the rims. Each shelf is 2 feet in width, and capable of containing 2 plants. The hot water pipes in the pit and those which warm the house are on the same level, and communicate with each other, so that only one fire is required. These pipes are all dished, for the purpose of holding water to create steam. The dishes in the pit are filled by means of one-inch leaden pipes, one end of which comes through the stage; and these are filled twice a day with hot water. There are also six small one-inch iron pipes, about eighteen inches long, which stand upright, and are screwed into the main pipes beneath the stage; the tops of these you can open or close, according as more or less moisture is required. The succession house is 25 feet long, 18

feet wide, and 12 feet high. One half of the stage is appropriated to suckers, the other half to year-old plants. It is capable of containing 30 year-old plants and 36 suckers. The suckers strike root more quickly on this plan than in bark. (*Gard. Chron.* 1843, 139).

At Thornfield, the stove in which Mr. Hamilton grows pines is also heated by means of hot water pipes. The wall is nine inches thick all round; the height of the back wall seven feet six inches, (from the trellis which lies close above the pipes,) to the glass. The wall at the ends and front is 18 inches above the pipes, at the top of the back wall. Under every light is a wooden shutter, nearly the width of the lights, and 10 inches deep, to admit air. These are opened from the outside. The length of the house inside is 28 feet, by 11 feet wide. The alley, which goes all round the house, and in which the pipes are placed, is 21 inches wide. The tan bed, which is surrounded by a nine inch wall, is 23 feet long by seven feet three inches wide; 3 feet deep at the back, and 20 inches at the front. Both ends of the house are glass. There are also twenty inch lights at the front, which are made to open, for the convenience of the operators. The whole roof is covered with nine entire and fixed lights, (no north lights,) and the laps of the glass are filled with putty. The pitch is four feet. The boiler is a half cylinder, and is fixed in the back shed, about

20 feet from where it enters the house. Although pipes are used, yet Mr. Hamilton recommends in preference the tank system. (*Hamilton on Pine Apple*, 98.)

Hot water in Gutters.—In a pit erected at Hewell, the seat of the Hon. R. H. Clive, of which pit the following is a plan, the bottom heat is supplied by



hot water in gutters, and the air-heat by a common flue. Its length is 40 feet 6 inches; its width inside, 12 feet 9 inches; its height in front, above the ground, 1 foot 6 inches, and at the back 5 feet 5 inches. A is an air pipe, whose orifice is at the ground level,

and which passes underground into a hot chamber, covered with wood, on which the pine bed lies. B is a smooth flue, passing along the front from the fireplace at one end of the pit, and discharging itself at the other end into an upright chimney. The shaded line right and left of the section shows the ground line; so that a large part of this pit is sunk into the ground. The other parts of the plan, which is drawn to a scale, speak for themselves. (*Gard. Chron.* 1843, 772.)

Hot Water in Tanks.—The boiler and apparatus for this are thus described in our former volume on the “Grape Vine:”—

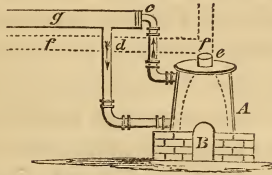
“Hot water in a tank is superior to the same source of heat in pipes, because it is not liable to freeze; and it is preferable to steam, because its heating power continues until the whole mass of water is cooled down to the temperature of the house, whereas steam ceases to be generated as a source of heat the moment the temperature falls below 212 degs.

“Mr. Rendle, nurseryman, Plymouth, the first successful suggester of the tank system of heating, has furnished us with the following particulars:—A tank of iron or wood, twenty feet long, five feet broad and six inches deep, is constructed in the centre of the house, and surrounded by a walk, except at the end, where the boiler is fixed for heating it. The

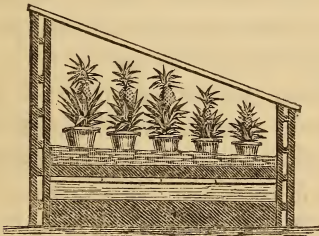
top of the tank is covered with large slabs of slate, cemented together, to prevent the excessive escape of steam. Around this is a frame sufficiently high to retain the bark, in which the pots are plunged. The boiler and tank are filled with water, and this circulates, when the fire is lighted under the former, by means of two pipes, one from the top of the boiler, and the other returning nearer to its bottom. The expense of piping, and danger of its freezing, is avoided; the fire only requires to be kept lighted for two hours at night, and again for the same period in the morning; the water, when once heated, retaining its temperature for a long time. In a small house the apparatus can be constructed for £5; and in all, for less than half the cost of hot water pipes. The saving in tan and labour is also very great; in some places tan costs 19s. per cart load, and where it is cheaper, the trouble and litter incident to its employment, and the dangers of loss from fungi and insects, of which it is the peculiarly fertile foster-parent, render it objectionable as a source of heat. And whenever the tan has to be renewed, the trouble and destruction of plants is always great.

“In the following sketch, for which we are indebted to Mr. Rendle—*A* is a transverse section of Roger’s conical boiler; *B* is the fireplace; *g*, the tank; *c*, the flow-pipe; *d*, the pipe by which the water returns to the boiler; *e*, is the hole for the

smoke, which, joined to a flue, *f*, can be made to ascend the chimney at once, or to pass round the house."



The following is the section of a pine pit to which the above apparatus is adapted.



It is described as a very useful and most desirable structure for the growth of the pine apple, with a hollow wall, recommended by all garden architects in preference to a solid wall—the heat or cold being not so readily conducted as through a solid mass of masonry. Mr. Rendle might have added, that hollow

walls are also much drier. (*Rendle's Treatise on the Tank System*).

Hot water in Tank and Pipes combined.—This has been done by Mr. G. Fleming, the excellent gardener at Trentham Hall. He says, in a pine pit recently erected at Trentham, the tank system of bottom heating and that of hot water pipes for top heat are combined; and for keeping a sufficient and steady heat, with a small consumption of fuel, nothing can be more satisfactory. The pit is seventy-seven feet long, and twelve feet wide inside, and is heated by what is called a saddle boiler. Under the bed are four tanks, into which the water is delivered from the boiler by a four-inch pipe, and after pursuing its course, is again received by another pipe. The advantage of two deliveries is, that the water not having so far to go does not get so cold before it is returned to the boiler, and the heat is more regular in all parts of the house. The depth of water in the tanks is about three inches. The tanks are made of brickwork, coated with Roman cement. They are arched over with brickwork also, which is cheaper than covering them with slates; and by leaving interstices between the bricks, of which the arch is composed, the steam is allowed to escape, and penetrating the stratum of rubble above to keep the tan in a proper state of moisture. The same boiler

also supplies a range of four-inch pipe, which goes round the pit. There are cavities in the wall to permit the steam from below to pass to the top of the pit. The aperture to those can be closed at pleasure, thus insuring a perfect command over the moisture of the atmosphere. There is a chamber which formerly contained a flue belonging to the house that occupied the place of the one we are now describing. This chamber has been left with the view of its being useful for filling with hot dung, either for the purpose of assisting to maintain the heat of the house, or for destroying insects. The tanks and pipes cannot both be worked at the same time, but they are fitted with stop-cocks, so that either can be worked at pleasure; and a few hours in the middle of the day, when the pipes are not wanted, is found amply sufficient to keep up the bottom heat, as the mass of material, when once heated, retains its heat for a considerable time. (*Gard. Chron.*)

Stove for Pines, Vines, and Cucumbers, conjointly.
—For the following directions in constructing this stove for joint-tenants we are indebted to Mr. Hamilton's little work on the Pine Apple:—

Build in a sheltered situation, but not to be shaded with trees, &c.; it should also stand to front the south, so as to have the advantage of the sun from morning until night. Where about fifty pine plants

are intended to be grown, the length of the house ought to be about 28 feet, by 12 feet 6 inches wide inside, surrounded by a nine-inch wall ; where the foundation is good, five feet will be high enough for the wall at the front and ends, which ought to be one foot above the ground level. The height of the back wall, nine feet ; three apertures to be left about three feet from the top of the wall ; they ought to be one foot high, and three feet wide, so that two vines may be turned out through each hole, in the winter, after their wood is ripe. They may be fastened along the wall, and if kept dry, will need no other protection ; they may either all be in and started at once, or at different periods (and the apertures built up again), according to the owner's demand. The back retaining wall of the tan bed must be built on piers, leaving arches for the vine roots to pass through into the prepared compost underneath the pines. The piers will have to be nine inches thick ; above which, a cavity must be left from the heated chamber to the top of the wall. The alley at the back ought to be at least three feet wide ; end alley, 21 inches ; front alley, 20 inches. The boiler must be fixed at either of the north corners of the house ; it will require two flow and two return pipes attached to it ; two pipes must be stretched along both ends and front, to heat the atmosphere in the house, and ought to be six or seven inches diameter. Each pipe must have a stop-

cock near to the boiler, so that the tank or hot water flue may be heated without affecting the air in the house. The other two pipes from the boiler to be connected with the tank or flue, underneath the tan bed; they may be of smaller size, and a wooden plug must be formed, partially to exclude the hot water when the heat is too violent; and whether a tank or flue is to supply the bottom-heat, they must be chambered over; and if circulated in a flue, it may be eight or nine inches wide, and four inches high, and must pass all round the bed one-and-a-half feet from the wall, and may be lined with either lead or zinc, or plastered with Roman cement; it may be covered with flags. But previous to building the flue, the bottom of the bed ought to be filled two feet with compost for the vine roots; and flags or bricks laid all round, on which the flue must be built. A flue thus constructed will give plenty of bottom heat for the pines, and will keep the soil and other materials moist, under which the vine roots may be expected to grow rapidly; and in very cold weather the cavity in the wall may be opened, which communicates with the heated chamber, in order to maintain a sufficient heat for the atmosphere; and upon the chamber in the pit, must be placed 20 inches of the materials to plunge in the plants. The roof sloping to the north and south, as well as the upright ends, will have to be glazed, and all the laps filled with putty.

The north lights, which are about five feet long, will extend over the back alley, under which the vines are to be trained ; the lights must be tilted up above the back wall when air is to be admitted. The materials in which the pines are to be plunged, may be sand, ashes, leaves, or tan ; but the latter two ought to be preferred ; and the plants may be occasionally turned out of their pots and planted therein. (*Hamilton on Pine Apple*, 100.)

Steam has been employed as a source of heating, but is now nearly abandoned, as being more costly and less effectual than hot water. The most wasteful way in which it was employed was by turning it into a bricked chamber beneath the bed ; but, whether in a chamber or in pipes, it required much more attention than hot water needs, and with the disadvantage that at night it cools too rapidly to exclude an injuriously low temperature.

CULTURE.

To succeed in producing a first-rate fruit, all attendant circumstances must be accordant with each other. It is not the procuring the soil from the same locality that a successful cultivator does, that will ensure success ; nor the harvesting of it, and taking

care of it, after it has been well harvested ; nor the right mode, or season, in making use of it ; though all and each is a matter of some importance. It is not such a sized pot made use of for fruiting pines, with so much charcoal added to the soil ; nor so many quarts of liquid manure applied so many times a week ; nor a certain stated degree of either atmospheric or bottom heat ; nor a certain time of applying, or degree of, heat, previously to giving air, or shutting up, that will ensure success ; neither will any peculiarly constructed house, or pit ; nor any especial heating apparatus ; but all and each must be accordant with each other to insure success.

Pine culture is perfect when its fruit, excellent in quality, is producible in the dessert throughout the year. This is now accomplished in many gardens, thanks to the advanced skill and science of our gardeners, who have now exploded many detremental prejudices in the culture of this fruit—extremely high temperature and disrooting among them—which were fatal bars to first-rate quality, and continued succession. The employment of lower temperatures has gained to the pine apple that great requisite for excellence of flavour—slow but unchecked growth ; for our experience is quite coincident with that of Mr. Knight, who says that he found all fruits (and particularly the melon) to acquire their highest state of excellence when their growth has been slow, provided

it has been regularly progressive, and that the fruit has ultimately attained its proper size and perfect maturity. He thought, and thought truly, that no fruit has ever been so perfect, either in taste or flavour, the growth and maturity of which had been greatly accelerated by much fire-heat, and, of necessity, abundant water. He, therefore, inclined to believe, that the pine apple will be found to acquire its highest state of excellence, when a considerable time elapses between the period of its blossom and that of its maturity. (*Knight's Papers*, 260.)

In the summer time, Mr. Hamilton says, he can ripen fruit in from twelve to fourteen weeks from the time they show, so that both sucker and fruit is perfected at that season in seven months.

This is the greatest rapidity of growth consistent with excellence of quality, and pine apples allowed a month longer to attain ripeness, unchecked, and having the same exposure to light, would attain, probably, a higher flavour.

From twelve to eighteen months elapse between the time of planting a sucker and ripening its fruit; but when a succession of fruit is obtained from the same stool, three fruits may be obtained from it in two years.

Bottom Heat.—There is no truth more important to be kept in mind by the gardener, in his stove department, than that the temperature of the soil in

which the plants are growing should be accordant with that to which their leaves are exposed. When we say accordant, we do not mean that the temperatures should be equal, but that the heat of the soil should stimulate the roots to imbibe nutriment just so fast as the temperature and light of the air enables the leaves to elaborate it. It is not difficult to find a rule for the gardener's guide on this point, for after numerous trials, both in this country and between the tropics, we find a close approximation to the truth to be, that the temperature of the soil ought to be just above the average of the temperatures to which the leaves of the plants growing upon it are subjected. Thus, if the pine apple grows in air, of which the extreme temperatures are 70 and 90 degs., the temperature of the soil in which they are rooted should be 81 or 82 degs. If the soil be heated solely by exposure to the air of the stove, this accordance of temperature is secured without trouble, but if there be a tank of hot water, or a mass of fermenting matter beneath the soil, great care is required, and great difficulties arise in the way of regulating the soil's temperature.

You may have the best of soil and water, but without bottom heat is very particularly and punctually attended to, great disappointments will ensue; there is more injury done by bottom heat than by all the other causes put together; and, in our opinion, this was, in the first instance, the means of giving them

the character of being annual-rooted plants. Of one thing we are certain, that by misapplication, bottom heat has often been the means of depriving them of their roots, not only annually, but almost every time their fermenting bed got renewed; which sudden checks are the principal cause of their producing such abundance of weak suckers, and such diminutive fruit. To prevent those unnatural checks and disappointments, Mr. Barnes plunges the pots they are growing in not more than two-thirds of their depth, with an inverted pot for each plant to stand on (any ill-shaped old pots, or such as have a piece broken out of the side, or are cracked, &c., are always put by for this purpose), the fermenting material being always kept tolerably loose about them. Should the bottom appear likely to heat strongly, merely give the pots a move back and front with a strong stake, which causes them to stand clear, with a cavity in the bark all round them, to allow the heat and air to circulate freely; and when settled loosen the whole bed up between the pots with a small hand fork, and strong pointed stake for the same purpose. (*Gard. Mag.*)

Mr. Knight having so frequently witnessed the difficulties and the folly attendant upon enormous and unnatural bottom heat, was led to repudiate it altogether—that is to say, to deny the necessity of using a fermenting or other heating body beneath as a medium. Now, be it remembered that Mr. Knight gave

little air and kept very high temperatures, especially when much solar light existed. By these means he obtained just what exists in nature—an advantage of a few degrees in the average of the bottom-heat over that of the atmosphere. Therefore, it appears Mr. Knight did not deny the propriety of bottom-heat, but merely the capricious means by which it is generally obtained. Mr. Hamilton, after long practice, during which he has met with extraordinary success, also approves of what is termed a very moderate amount of bottom-heat; about 80 degs. in the summer, and not much more than 70 degs. in the winter. Now, when we consider that an advantage of from 2 to 5 degs. exists in nature, in favour of the average temperature of the soil, as compared with the atmosphere; and that the average atmospheric temperature for pines in a growing state, under glass in Bicton, is something like 70 to 75 degs., or even 80 degs., we must come to the conclusion that Mr. Hamilton's practice is perfectly natural. (*Gard. Chron.* 1846, 726.)

We may as well detail here Mr. Knight's course of culture, without bottom heat, as practised at Downton:—

The suckers were put into pots of somewhat more than a foot in diameter, in a compost made of thin green turf, recently taken from a river side, chopped very small, and pressed closely, whilst wet, into the

pots; a circular piece of the same material, of about an inch in thickness, having been inverted, unbroken, to occupy the bottom of each pot.* This substance, so applied, affords efficient means for draining off superfluous water, and subsequently of facilitating the removal of a plant from one pot to another, without loss of roots. The surface of the reduced turf was covered with a layer of vegetable mould obtained from decayed leaves, and of sandy loam, to prevent the growth of the grass roots. The pots were then placed to stand upon brick piers, near the glass; and the piers being formed of loose bricks, without mortar, were capable of being reduced as the height of the plants increased.† The temperature of the

* From Mr. Knight's recommendation of chopping the soil small, and pressing it together while wet, we entirely disagree. We find no plant thrive and root so readily, receiving the least possible check afterwards, as the pine apple does when potted or planted whilst the soil is in a moderately dry, friable condition. After which, it is beneficial to apply the requisite quantum of water, either to the soil or over the foliage, according to circumstances of season, &c. Besides, it would be necessary, if green grass were made use of, to employ some other composition to prevent the grass from growing. From this we also quite disagree, and should never think of putting it into practice.

† It did not seem to strike this great man how bottom heat could be genially modified, within the same structure, with little trouble, and economising the expense and labour at the same

house was generally raised in hot and bright days, chiefly by confined solar heat, from 95 to 105 degs., and sometimes to 110 degs., no air being ever given till the temperature of the house exceeded 95 degs. ; and the escape of heated air was then, only in a slight degree, permitted. In the night the temperature of the house generally sank to 70 degs., or somewhat lower. At this period, and through the months of July and August, a sufficient quantity of pigeon's dung was steeped in the water, which was given to the pine-plants, to raise its colour nearly to that of

time ; but depend on it, it will be found still a great advantage, in pot culture, to have the plants standing partly plunged on the platform in open porous sweet materials ; and nothing would be so valuable for this purpose as charred refuse, which, by a proper application of moisture, would always give off, in the healthiest form, humidity, charged with ammonia ; and the tank, gutter, or hot-pipe system of applying bottom heat could be managed similarly, with the same materials as previously recommended, and a perforated pipe for furnishing the requisite kindly humidity and warmth about their roots. We cannot see how Mr. Knight could obtain the circumstances afforded by nature, when his plants were placed on brick piers, and he admitted to them but little air, in an artificial structure, without any material applied to absorb the natural heat, and give it off charged with humidity, &c. This, however, would be accomplished by furnishing between the piers, or, which would be better, amongst the pots, a body of charred materials. It is astonishing how quickly, and to what extent, charcoal does absorb heat, retaining and giving it off in a genial manner.

porter, and with this they were usually supplied twice a day in very hot weather ; the mould in the pots being kept constantly very damp, or what gardeners would generally call wet. In the evenings, after very hot days, the plants were often sprinkled with clear water, of the temperature of the external air ; but this was never repeated till all the remains of the last sprinkling had disappeared from the axils of the leaves.

Mr. Knight deprecated giving pine plants larger pots in autumn ; for the plants at this period, and subsequently, owing to want of light, can generate a small quantity only of new sap, and consequently the matter which composes the new roots, that the plant will be excited to emit into the fresh mould, must be drawn chiefly from the same reservoir, which is to supply the blossom and fruit ; and he found that transplanting fruit-trees, in autumn, into larger pots, rendered their next year's produce of fruit smaller in size, and later in maturity. As the length of the days diminished, and the plants received less light, their ability to digest food diminished. Less food was in consequence dissolved in the water, which was also given with a more sparing hand ; and as winter approached, water only was given, and in small quantities. During the months of November and December, the temperature of the house was generally little above 50 degs., and sometimes as low as 48 degs.

Most gardeners would have been alarmed for the safety of their plants at this temperature ; but the pine is a much hardier plant than it is usually supposed to be ; and one young plant exposed in December to a temperature of 32 degs. did not appear to sustain any injury ; and in the east the pine-apple is growing in the open air, where the surface of the ground, early in the mornings, shews unequivocal marks of a slight degree of frost. The plants remained nearly torpid, and without growth, during the latter part of November, and in the whole of December ; but they began to grow early in January, although the temperature of the house rarely reached 60 degs. ; and about the 20th of that month, the blossom, or rather the future fruit, of the earliest plant became visible ; and subsequently to that period their growth was rapid.* This rapidity of growth, in rather low temperature, may be traced to the more

* As to giving pine plants larger pots in autumn, we then, and at all times, shift and repot when the plants are considered to require it ; and indeed are very particular in giving all that require potting a good shift in autumn, to provide against the contingency of the weather proving unfavourable in winter ; though we would as readily shift a pine at Christmas as at any other season. How is a quick growth to be made, and a succession of fruiting plants to be kept up, if the succession plants are allowed to stand stationary in winter months ? Indeed, the Kinghtian system of pine growing will not do in these railway times. It would be quite impossible to maintain a succession

excitable state of their root, owing to their having passed the winter in a very low temperature comparatively with that of a bark-bed. The plants in winter were supplied with water in moderate quantities, and holding in solution a less quantity of food than was given them in summer. (*Knight's Papers*, 243.)

As the application of bottom heat is acknowledged to be one of the most important points in successful pine culture, we shall not be thought needlessly prolix in offering some more general remarks upon the subject, before proceeding to observe upon the management of some of the sources from whence it is usually derived.

As it is needful to keep up, or furnish, different degrees of heat and evaporation for fruit-swelling plants, and those in blossom, and those in earlier stages of growth, to continue a succession of good fruit throughout the season, just so is it needful to have a structure on a good principle, in compartments, with full command of means for applying an appropriately-heated humid atmosphere, or a dry atmosphere, as these stages of growth may require. These changes would be easily commanded by employing some one or other of the structures described in the last section. Thus, a tank, or gutter-heating

of good fruit throughout the season, if, during any part of it, they were allowed to be stationary, or nearly so.

apparatus, well constructed, the application of perforated pipes, or a shallow gutter added to the under pipe running in front of the structure, would furnish a command of humidity whenever requisite.

In our variable and dark climate it is found necessary to have at command a greater degree of bottom heat than top heat, particularly in the shortest days of winter ; the same holds good for top heat in light arid weather ; a full command of this essential should be at hand, and easy of command in both compartments, to assist nature whenever requisite. The system of obtaining bottom heat from fermenting materials, we entirely condemn for pine culture ; the tank, or gutter system of bottom heating is equally objectionable, for placing the plunging materials on the top of the tank is obviously wrong in principle, and must also be a great waste of heat by absorption and confinement ; besides its subjection to as sudden fluctuation as the old principle, particularly where the tank or gutter system is depended on, in a great measure, at all seasons, for heating the internal atmosphere as well. Every practical man must be well aware how subject the atmosphere, soil, plunging materials, and the whole interior of the structure, must be, under certain circumstances, to sourness, dryness, sudden stagnation, &c., upon such a principle in our variable climate. We are advocates for the heated air system of applying both bottom and top heat, when fully

carried out upon correct principles, combined with economy.

At Bicton there is a pit for growing succession plants, in compartments of six lights; and generally some late pines in the season are fruited in one compartment. These are often started, bloomed, set evenly every pip, and have surpassed the swelling of those in the house or stove, which has been kept at night from 68 to 72 degs., with the assistance of hot-water pipes, capable of commanding any required heat, while those in the above pit have nothing more than a lining of well-wrought leaves, a little stable dung amongst them, and covered at top with dried short grass, placed against the wall to the top. But do not mistake the principle upon which this lining is applied to heat both bottom and top, because long practice in those matters has pretty clearly pointed out to us the simple principle is a good one, for furnishing a humid kindly bottom heat of warm air, also a kindly-heated humid atmosphere about the interior of the structure, to circulate among the plants. This pit was constructed by Mr. Barnes's predecessor, for containing the large body of three or four feet in depth of hot tan, for furnishing the then requisite bottom heat; and because there should be no mistake in the application of it, the pit, or rather walls of the pit, were constructed with pigeon-holes all round, to the height of three feet six inches, or thereabouts;

the pit and trench for the linings being sunk to the above depths, and shutters to cover the lining trench. Of course, this was intended for no other purpose than applying a still stronger bottom heat ; this, to Mr. Barnes, appeared a reversal of the natural system. For the sun rays not only heat the atmosphere from above, but also the soil the plants grow in, in their native country. To alter the reversing custom, Mr. Barnes cleared out this large body of fermenting materials inside of the pit, filled it with wood and faggots to the height of the pigeon-holes, packed firmly together ; on this he placed some old thatch and rubbishy straw, to prevent the little plunging material from running amongst the wood, which plunging material is about a foot of well-wrought sweet tan, which is forked up amongst each row of pots to about two-thirds their height, as lightly or loosely as possible ; the arranging of each row of plants is carried on, the largest-sized pots are put on three bricks, placed triangular ; and the others on two, each a distance apart, thus securing a healthy unobstructed circulation of heat, air, and water ; for the tan is often hoed, or stirred over lightly with a long slender iron crook, fixed to a handle, which lightens and moves it nearly to the depth of the pots ; the roots are always in the most vigorous, healthy condition ; those, the fruiting plants, at this time (May) are all over the tan, from the side and bottom

holes of the pots, and appear like a white net even amongst the wood. The linings are built up to the very summit of the pit all the winter, but not turned lower than the solid wall to the first row of pigeon holes: this answers the purpose of sun, or atmospheric heat from fire, by drying up the internal humidity throughout the dark short days, as the heat is principally thrown in *above* the plants and fermenting materials, which acts the part of both sun and fire heat in the most complete manner. As we gain light and solar heat, the linings are turned to the bottom, which is generally filled, all the winter, and trod in firmly, with dry leaves from the bottom to above the top row of pigeon holes. For the purpose of commanding a kindly humidity and heat throughout the interior, both at bottom and top, a cavity is left at the side of the pit, and strait straw or brushwood placed against the top row of pigeon-holes to keep the cavity from being choked up, which can be moved or removed with little trouble, to admit of a free circulation all over the interior of the pit of heated humid air: it answers the purpose admirably. By some cultivators it has been recommended to cure an excess of bottom heat, by pouring about the fermenting materials abundance of water;—this certainly is a fair way of establishing one excess for the other. If it was performed in due time to save burning the roots by its application, the question is, whether oftentimes

they did not suffer as much by the swampiness and sourness of the plunging material—besides, what system of regulation could be commanded under such circumstances, besides the extra loss of labour and sacrifice of property? No wonder at pine apples being considered annual-rooted plants under such an entirety of unnatural application of bottom heat—no wonder at Mr. Glendinning stating, that in the winter months the young plants must be kept stationary, or nearly so—no wonder, indeed, if they were to stand stationary, under such circumstances, when it was recommended to apply in autumn an extra supply of hot tan to carry them through the winter months, and deprive them at a certain time in spring of their roots; needful operations enough, no one could deny, under such unnatural treatment and circumstances. Thousands of pine plants in those days were forced and driven along with their long, narrow, thin leaves, with no other live roots to them during their whole existence, than the few they continued to form, as a matter of necessity, in the axils of the leaves; and if they then had been subject to the liberal airings and free ventilation we keep in practice, they would have been blown out of their pots. No wonder that shading should be recommended and adopted to such an extent in those days by the great pine cultivators—no wonder, indeed! But on this we shall observe more fully in our next volume.

Our system is always to keep the surface of the soil and plunging materials pretty moist, by frequent syringings in fervid weather ; and by keeping a quantity of rough lumps of charcoal spread about the surface, a genial vapour is at all times in circulation, particularly in sunny days, when it is most requisite.

We will now furnish some directions for the management of some of the sources from whence bottom heat is usually obtained.

Tanner's Bark, if employed as a source of heat for the pine apple, requires very constant attention to preserve it from injurious vicissitudes of temperature. Fresh bark should always be had for this purpose, not more than a week or ten days, or at the most three weeks, out of the tan-pit.

Tan, when it has undergone a good and regular fermentation, for a period of about four weeks, if kept from excessive moisture, has a sort of charm for the growth of all plants that are natives of warm climates. When it is to be used as bottom heat, it will be advisable to keep it in a dry shed while in a state of fermentation ; and it being full of moisture when taken out of the tan vats, it will require no additional moisture while in a state of preparation for the growth of pine apples, or any other exotic. The time required to bring it into a sweet state will be about four weeks. Three or four turnings will be necessary ; and during the operations of turning, let

the middle of the heap be turned outside, and *vice versa*, this treatment will bring it into a fit state for the purpose of growing pine apples, and it must not be used until it has undergone that length of time in its preparation, and has acquired a black, decaying state. If white and mouldy, it must be well watered, and left a few weeks longer until its moist decay is established. If leaves are used in place of tan, they will require about the same time and attention to turnings to bring them into a sweet state; they should also be in a moderately moist state, viz., between the two extremes of wet and dry. (*Mills on Pine Apple*, 50).

The pine apple plant succeeds best when the heat in the tan or leaves is so strong as to admit of the pots containing their roots being plunged into it only a few inches, say half their depth; at which depth the heat should be between 90 and 100 degs.*; and in this heat, supposing it to be moist and sweet, the plants will make great progress if well rooted, and if not, they will make roots very rapidly if in their growing season, viz., from February to the end of October. When the pit has been filled with fresh plants about six or eight weeks, the tan will probably have become somewhat dry within about a foot of its

* This heat will not raise the temperature of the soil in the pots to more than from 80 to 85 degs.

surface ; which will be readily ascertained by withdrawing the watchstick. This is a stick thrust into the tan, which, on being removed and grasped in the hand, where it had been immersed, will readily give the state of heat and moisture with sufficient accuracy. If the bed should be found dry, the plants should be taken out of it immediately, and the tan should be soaked with water, sufficient to make it quite moist.

Bark should not be very large or small ; as the first is apt to heat too violently, and the other soon becomes mere vegetable mould, and ceases to ferment. It should be moderately dried before it is put into the pit, otherwise it will cake and heat too much ; it should also be turned over, and lightly shaken up, in order to bring it to a proper temperature. Previously to plunging the plants, it is necessary to screen all the bark in the beds annually, that the fine parts may be separated from the coarser, the latter being still fit for use ; for if new bark be added to old that is much decayed, without screening, it will not be sufficiently porous enough, and will therefore burn. When the old tan is screened, that part of it which is fit for use again should be spread of an equal thickness all over the pit ; then bring in a sufficient quantity of new tan to raise the bed to its proper height, which should be full three feet thick ; and with a fork stir up the bark from the bottom of the pit, mixing the new and

old well together ; which, if properly performed, will continue a moderate heat for four or five months. The best season to screen the bark is in the month of September ; for the beds will be put into a good condition for the winter. When these beds begin to decline in heat, some new bark should be added, to renew it again. Many gardeners place their new tan in the beds in layers, and plunge the plants in old bark on the top of the new ; but this method cannot promote the welfare of the plants so much as when the bark is screened, and the new and old mixed well together ; for the fermentation is not so moist when the pots are plunged in all old bark ; and when it is all new at the bottom, the roots are apt to be burnt by the bark heating too violently. (*Giles on Ananas*, 8.)

Mr. Dall, gardener to the Earl of Hardwicke, at Wimpole, uses, and recommends, for the more safe and expeditious manner of filling tan round the pots that are partly plunged into the bark-bed, as here stated, a pipe or funnel made of sheet-iron ; the mouth that receives the tan is 15 inches, and the lower end four and a half inches diameter, with two handles fixed to it, so that the operator easily holds it while a lad is filling in the bark from a flower-pot. (*Hort. Soc. Trans.* vii.)

Oak Leaves are often employed as a substitute for tanner's bark in the pine stove. In districts where

the oak abounds they are cheaper than bark, and, if properly managed, they yield heat more permanently. After being raked into heaps, the leaves should immediately be carried to some place near the hot-house, where they must lie to couch, there to be fenced round with hurdles, or any thing else, to keep them from being blown about the garden in windy weather. In this place tread them well, and water them in case they happen to have been brought in dry. Make the heap six or seven feet in thickness, covering it over with old mats, or tarpaulin, to prevent the upper leaves from being blown away. In a few days the heap will come to a strong heat. Let them remain in the heap for five or six weeks, by which time they are properly prepared for the hot-house. In getting them into the pine pits, if they appear dry, water them again, treading them in layers exceedingly well till the pits are quite full. Then cover the whole with tan to the thickness of two inches, and tread thoroughly till the surface become smooth and even. On this place the pine pots, in the manner they are to stand, beginning with the middle row first, and filling up the spaces between the pots with tan. In like manner proceed to the next row till the whole be finished; and this operation is performed in the same manner as when tan only is used. After this, the leaves require no farther trouble the whole season through, as they will retain a constant

and regular heat for twelve months, without either stirring or turning. (*Spechley on the Pine Apple*, 304.)

Surface covering for the tan, or leaves, is desirable not only to preserve them in a more regular state of moisture, but for neatness. A covering of sand, three inches deep, excludes insects from harbouring in the bed, but moss has the best appearance.

END OF VOLUME I.

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