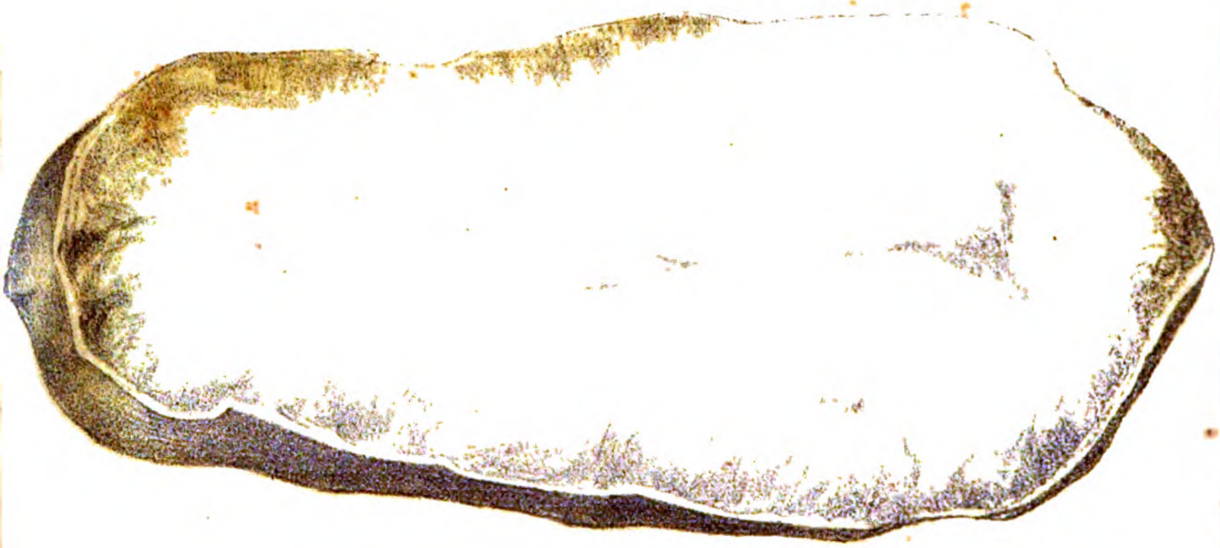
Exterior appearance of diseased Potato.



Internal appearance of the same Potato.
Cut through the Centre.

THE

GARDENER'S

MONTHLY VOLUME.

THE POTATO;

ITS CULTURE, USES, AND HISTORY.

BY GEORGE W. JOHNSON,

Editor of The Gardeners' Almanack, The Dictionary of Modern Gardening, &c.

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HISTORY OF THE POTATO.

THE potato is one of the greatest blessings bestowed upon mankind; for, next to rice, it affords sustenance to more human beings than any other gift of God. It has been impiously called the curse and the Upas of Ireland; but the abuse of the blessing is the curse, and it is as unjust thus to condemn it as it would be to anathematize iron, because man has formed from it the rack, and the thumbscrew, as well as the ploughshare, the loom, and the compass.

The potato is a blessing so long as it is only a subsidiary food of a people; adopted by them, as in England, as an aid, or resource, when other better food is deficient, and as a diluent, or corrective, of grosser animal nutriment. No man in a mild or torrid climate can live healthily upon a preponderating animal diet; and it is for the purposes of giving the quantity required for appeasing the sensation of hunger that such food as potatoes and rice are so beneficial.

In Ireland this cheap produce has become the chief, the staple, food of the inhabitants; and, as the staple food of a people regulates the price of wages paid for their labour, wages have become so low in that country, that when a dearth of potatoes occurs, the day's earnings are not sufficient to purchase a day's sustenance of dearer food. But why has the potato become the staple food of Ireland, but because the priest and the middle man in days not yet passed encourage the division and subdivision of paltry holdings into others still more and more miserably small? This subdivision of farms, says Mr. Macculloch, has been both a cause and a consequence of the use of the potato as a principal article of food. A small farmer, or even proprietor, with five, ten, or fifteen acres of land, cannot afford to feed himself and family on bread and beef. He is compelled to resort to inferior food; and as the potato affords the greatest quantity of nourishment from a given extent of ground, to that he naturally resorts; and this facility of obtaining support tempts to a further division of the holding. Such have been the consequences of the extreme subdivision of landed property in Ireland; and it has been fostered by the priest and the middleman, because each fraction of a holding is productive of further fees and increased rentals.

Where, as in England and Scotland, the potato ground is only the poor man's aid, not his all it is indeed a blessing; and it is told in these few words of an allotment tenant: "There are but few davs in the year, sir, on which we cannot get a meal's help from it." Most assuredly, therefore, do I think that the descendants of Raleigh might be proud of a sprig of the potato foliage on their coat armour, as those of Appel de Kapoesang are of its tubers, with which the Austrian heralds have charged their shields;* and it is with the hope of combining and diffusing the latest and best information relative to this esculent—to disabuse the public mind from growing prejudice—and to disseminate widely the most successful modes of culture—that this little volume has been prepared.

There is every reason to believe that Chili, and especially the neighbourhood of Quito, is the native country of the potato. It is there now found in a wild state; its slightly bitter tubers have been thence imported of late years; and cultivation has gradually raised from those tubers plants now producing crops of excellent potatoes. We learn, also, from Peter Cieca and Molina, that when the Spanish navigators first visited Chili and Peru, their inhabitants cultivated and ate a tuberous-rooted plant, which they called *papas*. Molina says there are two kinds: the wild, having small bitter tubers; and the other, im-

* De Kapoesang was the first successful cultivator of the potato in Austria.

proved by culture, so as to have tubers grateful to the palate.*

The Spaniards imported the potato into Spain, where it was called *battata,* from the resemblance the tubers bore to those of the sweet potato (*convolvulus battata*), and from thence it was communicated to Italy. This was at the close of the 15th or early in the 16th century; yet at the latter period the potato was so little known even to botanists, that Lobel, in his "*Plantarum seu Stirpium Historia,*" published at Antwerp in 1576, has no mention of it, though he describes and figures the sweet potato. Gerarde, in

* P. Cieca's *Chronicle*, published in 1553. Molina's *Hist. of Chili.*

The Spaniards first visited South America in the year 1492, and there is no rational doubt of this being the earliest period in which the potato became known to Europeans. Clusius and some others have surmised that the *arachidna* described by Theophrastus was the same plant, although the suggestion does dot appear with a single reason to sustain it; but it seems to me that the arachidna is identical with the aracidna of Pliny (*Hist. lib.* xxi. *cap.* 20), and this appears to have been synonymous with our truffle. Pliny says it was a root having no leaf or stem or any other part above ground. Cortucius had a similarly groundless opinion as to the identity of the potato with the *picnocomus* of Dioscorides. This certainly was not the potato, for it is described as growing wild in southern Europe in stony places, as having acrid leaves, and seeds narcotic, producing heavy, disturbed sleep.

England, however, and Caspar Bauhine, at Basil, both in the year 1596, gave notices of their acquaintance with it, yet still evidently as a rarity.

Caspar Bauhine, in his *Phytopinax seu eneumeratio Plantarum*, published at Basil in 1596, first bestowed upon it the botanical names it still retains—Solanum tuberosum; and his description is also the first occurring that is full as well as accurate. Some of the particulars intimate a knowledge of the consequences of certain modes of treatment that we have been lately, and, it would seem, mistakenly, considering of recent discovery. The root, he says, is round, but not completely so, of a tawny or dark reddish colour, and is usually dug out of the earth in the winter, being replanted in the spring. "Nevertheless, if left in the soil it will again vegetate in the spring. Very often the root becomes rotten after it has put forth the stem." It was known as the Spanish or Indian pappar, and endured without difficulty the climate of Europe, for he had seen it in the open gardens of some physicians in the Netherlands.

In his *Prodromus*, published in 1671, Bauhine gives a drawing of the potato, shewing the tubers as both round and oblong, and enters still more fully into its description. He says it was first brought from Virginia to England, and from thence was exported to France, and from the latter country was distributed to other parts of Europe. In Virginia it is called *openawek,* as is stated by Peter Cieca and in Gomara's History of the Indies. About Quito it was called *papas,* and thence it was sometimes called the Indian or Spanish papas ; and in Germany *grublingbaum,* that is the tuber-bearing shrub. Bauhine says that he first delineated it in 1590, from a specimen in the garden of Dr. Scholtz, who probably received it from Clusius.

Peter de Sivry, Lord of Walhain, had the potato, in 1587, from a friend of the Pope's legate in Flanders. It was brought from Italy under the name of *tortufoli,* a name applied to all underground tubers by the Italians. The Lord of Walhain gave two of the tubers to Clusius in 1588. (*Clusius History Plant.*)

Our countryman, Gerard, in 1596, specifies the potato, under the title of *papus hyspanicus,* in the catalogue of plants cultivated by him in his garden at Chelsea.* In his " Herball," published the year following, he describes the potato accurately.† After particularizing the sweet potato, which he calls " Sisarum Peruvianum, sine Batata Hispanarum, Potatus or Potatoes," he proceeds to the consideration of the common potato, under the title of " Potatoes of Virginia. Battata Virginiana sive Virginianorum et

* Catalogus arborum fruticum, etc. in horto, J. Gerardi, civis et chirurgi Londinensis nascentium. London. 1596.

† Herball, or General Hist. of Plants. London. 1597.

Pappus." The woodcut and the description demonstrate that the plant he had before him was our common potato; and he proceeds to observe, that, "It groweth naturally in America, where it was discovered, as reporteth C. Clusius; since which time I have received roots hereof from Virginia, otherwise called Norembega, which grow and prosper in my garden as in their own native country."* After stating the time of its blooming, &c., Gerard adds, "The Indians call it papus (meaning the roots), by which name the common potatoes (sweet) are known to them. We have the name proper unto it mentioned in the title, because it hath not only the shape and proportion of potatoes, but also the pleasant taste and virtues of the same; so we may call it, in English, potatoes of America or Virginia. Being likewise a food, as also a meat for pleasure, either roasted in the embers, or boiled, and eaten with oil, vinegar, and pepper; or dressed any other way by the hand of some cunning in cookery."

In 1633, "Thomas Johnson, citizen and apothecary," published a new edition of Gerard's Herbal, and it is very apparent that the potato had then improved under cultivation, for the tubers there repre-

* At the end of the preface is a portrait of Gerard; and it deserves notice, that he holds in his hand a sprig of the potato —leaves, flowers, and fruit—as if he considered it one of the most remarkable novelties of his time.

sented by him are large, and resembling the Julys now cultivated in form; whereas those portrayed by Gerard are small and globular, like those produced by the plant in its wild state.

The positive testimony of Gerard proves that the potato was forwarded to him from Virginia; and how they reached that province of North America will be made to appear probable by the suggestions of Humboldt, in a following page. Gerard, we may conclude, received the tubers from some of the settlers in Virginia, who emigrated thither about twelve years previously, in 1584, under a patent granted by Queen Elizabeth to Sir Walter Raleigh. And thus much is certain, that, in 1693, Sir Robert Southwell, President of the Royal Society, communicated to that learned body the fact that his grandfather first cultivated the potato in Ireland, and that he obtained it from Raleigh.* Tradition states, further, that Sir Walter himself also had the root planted on his estate near Youghall, in the south of Ireland; and that he gave them to his gardener as a desirable fruit from America. When the berries were ripe in September, the gardener brought them to his master, with the inquiry of disappointment, "Sir, are these the fine American fruit?" Sir Walter, either really or pretendingly ignorant of the potato's habit, desired them

* M.S. Minutes of the Royal Soc. in loco, Dec. 13, 1693.

to be dug up as weeds, and thrown away; but in doing this the tubers were revealed, and found to be the available produce.*

Humboldt rationally concludes that the Virginian colonists obtained the potato from the Spanish settlements, for it is quite clear that it is not a native of Virginia nor even of intervening Mexico, and that it was cultivated in Spain and Italy before it was made known in England from Virginia.

Although the potato was known to English botanists in 1596, yet horticulture was too ignorantly practised in this country to permit its rapid introduction among our cultivated crops. In 1619 they were here a desired yet expensive luxury; for in that year of James the First's reign, a small dish of them provided for his Queen's table cost one shilling per lb., when money was at least twice as valuable as it is now.

Potato cultivation spread rapidly in Ireland; and it became established, it is said, in Lancashire, and

* It has been stated, but upon no good authority, that potatoes were cultivated in Ireland long before the time of Sir Walter Raleigh; and Sir John Hawkins in 1565, and Sir F. Drake a few years later, have been named as the probable first importers. If they introduced any such tubers they were probably those of the sweet potato (*convolvulus battata*); but as the author who makes the suggestion intimates that a passage in Bede's writings can only apply to the potato, we may very justly conclude that both surmises are equally worthy of attention. (*Holt's Kings of Eng.* iii.)

that portion of our northern coast still celebrated for its culture, owing to some being on board a vessel wrecked upon its shore. Yet the value of the root was not generally known at a still later period, for in a time of scarcity, namely, in the March of 1663, it required to be recommended as a crop of national importance in a letter addressed to the Royal Society.* The writer of this letter was Mr. Buckland, a Somersetshire gentleman; and the recommendation was referred for consideration to a committee by the society. The report of that committee was favourable, and the society not only urged its cultivation to landed proprietors, but requested Mr. Evelyn to enforce the society's opinion in his "Sylva," then publishing under its auspices, although it was no favourite with him, for in 1664, in his "*Kalendarium Hortense,*" he says, "Plant potatoes in February in your worst ground." Before the "Sylva" appeared, namely, in 1664, was published a pamphlet, the first devoted to the subject of cultivating the potato, and bearing this prolix title—"England's happiness increased, or

* Although not extensively cultivated, yet it began to be esteemed; for, in 1655, Muffet observed, that even the husbandman bought its roots to please his wife. *(Health's Improvement.)* There was some sly allusion in this; for Parkinson, in 1656, observes, that the potato "was foolishly called the apples of youth;" and Shakspeare makes Falstaff include it in some of his wanton ribaldry.

a sure and easy remedy against all succeeding dear years, by a plantation of the roots called potatoes, whereof (with the addition of wheat flour) excellent, good, and wholesome bread may be made, every year, eight or nine months together, for half the charges as formerly. Also, by the planting of these roots, 10,000 men in England and Wales, who know not how to live or what to do to get a maintenance for their families, may, of one acre of ground, make £30 *per annum*. Invented and published, for the good of the poorer sorts, by John Forster, Gent., of Harslop, in Buckinghamshire." He says that the potatoes he recommends for general cultivation, " are the *Irish potatoes*, little differing from those of Virginia, save only in the colour of their white flowers. These roots, although they came at first from the Indies, yet prosper well in Ireland, where there are whole fields of them, from whence they have been brought into Wales and the north parts of England, where they likewise prosper and increase exceedingly." He recommends a dry, well-drained soil for them, to be enriched with dung if necessary. Planting in March, with tubers cut into quarters or halves, to be buried six inches deep and eight inches asunder. The roots, he says, may be begun to be taken up in September, and as wanted until March; so that even then it was known to the cultivator that the colds of winter would not destroy the tubers; and Mr. Forster further adds, that the very small roots must be left in the ground to produce a crop the next year. In conclusion, he gives directions for making potato bread, potato biscuits, potato pudding, potato custards, and potato cheesecakes. The produce from good ground was three or four heaped bushels per rod. No one, he says, will grudge for them a shilling per bushel. Mr. Forster then considers the growth of potatoes as a political question, and recommends the King, Charles the 2nd, to order an importation of the root from Ireland; and that every man in every parish shall grow an acre or two; and that, out of every £30 worth grown in a parish, £5 shall be paid to the King! He concludes by stating how the potato may be raised from seed instead of from the root.

Notwithstanding the widely-disseminated opinions of the Royal Society, and these published appeals to the public, the introduction of the potato, as an object of cultivation, was extremely slow.

Worlidge, in 1687, although he remarked that the potato was then common in some parts of the continent, merely suggests that they may be useful for swine or other cattle.

Houghton, writing in 1699, says, they were then very common in Lancashire, being introduced from Ireland, and that they began to spread over England. The roots were boiled or roasted, and eaten with butter and sugar! (*Collections* ii. 468.)

Sharrock, Ray, Lisle, Bradley, Mortimer, &c., writing at the close of the 17th, and early in the 18th century, make most slighting mention of the potato, and even Miller, in the 4to edition of his dictionary, published as late as 1771, only mentions the same two varieties, the red and the white tubered, which had been noticed by writers a century his predecessors.

Salmon, who wrote in 1711, speaks of the *Virginian*, and the *English*, or *Irish potato*, as distinct kinds, though his description shows their identity—the only difference being, that the colour of the skin of the tubers of the first was dirty white, and of the second, red. "They are only nursed up in gardens in England and Ireland, where they flourish and come to perfection, prodigiously increasing to a vast plenty. The roots are boiled, baked, or roasted." (*Salmon's Herbal*, 905.)

London and Wise, in the seventh edition of their "*Compleat Gardener*," published in 1719, do not even mention the potato (but it must be remembered that this is only an abridged translation of M. Quintinye's work, published some years previously.) However, even as late as about 1770, the potato was not known generally in our south-western counties. The late president of the Horticultural Society, writing in 1831, when he was seventy-two years of age, says—

"I can just recollect the time when the potato was unknown to the peasantry of Herefordshire, whose gardens were then almost exclusively occupied by different varieties of the cabbage. Their food, at that period, chiefly consisted of bread and cheese, with the produce of their garden, and tea was unknown to them. About sixty years ago, before the potato was introduced into their gardens, agues had been so extremely prevalent, that the periods in which they, or their families, had been afflicted with that disorder, were the eras to which I usually heard them refer in speaking of past events; and I recollect being cautioned by them frequently not to stand exposed to the sun in May, lest I should get an ague.

"The potato was then cultivated in small quantities in the gardens of gentlemen; but it was not thought to afford wholesome nutriment, and was supposed by many to possess deleterious qualities.

"The prejudices of all parties, however, disappeared so rapidly, that within ten years the potato had almost wholly driven the cabbage from the garden of the cottagers." (*Knight's Papers*, 319.)

Mortimer's "Whole Art of Husbandry," was published in 1707, and a sixth edition in 1761, and in these the potato is dismissed, after a brief notice of ten lines, about half of which are occupied with these observations:—"The root is very near the nature of the Jerusalem artichoke, but not so good or wholesome. These are planted either of roots or seeds, and may probably be propagated in great quantities, and prove good food for swine!"

One reason, certainly, that the plant remained so long in disrepute, was the defective mode of its culture. This, and ignorance of the proper mode of cooking the tubers, would make them certainly anything but a tempting article of food. The following anecdote illustrates this :—" A person, who had been invited to taste the first potato planted in the county of Forfar, N.B., about the year 1730, related that the roots had been merely heated, and that they adhered to the teeth like glue, while their flavour was far from agreeable. The food was thus about to be condemned, when the accidental arrival of a gentleman, who had tasted a potato in Lancashire, caused the rejected roots to be remanded back to the hot turf ashes till they became as dainty as they had before been nauseous."

According to the old statistical account of Scotland, potatoes were first cultivated in the fields there, in the year 1739, in the county of Stirling; and Dr. Walker assures us, that they were not known in the Highlands and Isles till 1743. It is stated in the General Report of Scotland (vol. ii. p. 3.), as a well ascertained fact, that "in the years 1725-6, the few potato plants then existing in gardens about Edinburgh were left in the same spot of ground from year to year, as recommended by Evelyn; a few tubers were perhaps removed for use in the autumn, and the parent plants well covered with litter, to save them from the winter's frost. Notwithstanding the success that, after this period, attended the culture of the potato among the cottagers, its progress among the higher classes in Scotland was retarded by the opinions of different writers on agricultural subjects, already mentioned; and also, what is not a little singular, a mistaken zeal in religious matters made some of the Scotch folks hostile to the innovation. 'Potatoes,' said they, 'are not mentioned in the Bible!' and this was deemed quite a sufficient reason for rejecting them. Famine, at last, gave the great impulse to the cultivation of this root, and during the latter part of the eighteenth century, its excellent qualities became generally understood." (*Quart. Journ. of Agric.*)

The Netherlands received the potato from England, and from thence it found its way into different parts of Germany. It was very late before it came into general cultivation in Sweden and Denmark, and even Saxony, but in all these countries it is universally used at present. In Switzerland, potatoes seem to have been introduced about the year 1720; they now form a principal article of food there. Poland is, perhaps, as remarkable as Ireland for their extensive cultivation.

It is only within these forty years that any particular attention has been paid in France to the cultivation of potatoes. They were long regarded as an unwholesome plant, and only fit to be eaten by cattle and the most wretched of human beings.

In 1698, Dr. Lister remarks, that the potato had then become a great relief to the people of England, though it was rarely to be met with in the French markets. (*Travels*, 149.) It continued in France to be esteemed as food fit only for the lowest classes until the year 1749, and then came somewhat into repute, but was again disused by the aristocracy until MM. Faiguet and Parmentier caused bread and biscuit to be made of its meal.

It is probable that the French had only cultivated the inferior sorts, and did not know that better kinds could be procured. Parmentier, so distinguished by his zeal for chemistry, was the first who made any markedly successful exertion in behalf of this decried and unpopular plant. He thought that the best plan to introduce it into general use, was to make it popular with the higher orders. For that purpose, in 1785, he presented Louis XVI. with a nosegay, made with flowers of the potato, and the sovereign graciously received the emblem of a plant the most likely of any to guarantee his subjects against the horrors of famine. This ingenious mode of bringing a plant, which had hitherto been so much despised, into fashion, was eminently successful. The courtiers, always ready to flatter the taste and wishes of their monarch, hastened to cultivate an article honoured with his regard, and thus France, in a great measure, owes the more extensive culture of potatoes to courtly flattery. (*Mr. McAdams. Quart. Journ. of Agric.*)

It was more early esteemed in Germany, for Clusius says, in 1601, it was sufficiently common in their gardens; and in 1780, Dr. Martyn states, that he saw it extensively cultivated in Swabia.

So slow has been the progress of this root in Norway, that Van Buch observes it was scarcely known at Bergen, in 1762; a circumstance the more remarkable, as a century and a half has elapsed since its introduction into Iceland, the climate of which is less favourable than that of Norway. In about twenty years the potato found its way into Nordland, and not long afterwards was introduced into Finmark, where it has now become pretty general. The potatoes of Alten, though seldom exceeding the size of a small egg, form, nevertheless, a valuable addition to the resources of the inhabitants of Lapland. Their produce usually averages about thirty fold, and in some instances it has reached to forty-four. The price is usually from 3*s.* 6*d.* to 5*s.* the barrel, or sack, of four English bushels. The potatoes grown in Finmark are remarkably sweet to the taste, of a waxy nature, and in colour of a deepish yellow. (*C. Brookes's Trav. in Lapland,* 203.)

In other quarters of the globe the potato is extensively cultivated, especially in North America, and in some parts of its southern latitudes. It has spread throughout the Islands of the South Seas, and in Australia and New Zealand its judicious culture seems to have preserved it from the disease devastating it in all other countries. At the Cape of Good Hope, and St. Helena, I have eaten them in as great perfection as in England, and found them scarcely inferior in the still more torrid latitude of Bengal. At the horticultural show, in Calcutta, during 1842, I saw potatoes exhibited which would not have shamed the potato-growers of Lancashire, if mistaken for their produce. These were grown in the immediate vicinity of the city, but in the hills of Chirra Poongie, though not far distant, the potatoes are grown still finer. They were an object of cultivation there during the Governor-Generalship of Warren Hastings (1772-1785), and, alluding to that period, a recent writer observes, "Threescore years ago, a basket of potatoes, weighing about a dozen pounds, was occasionally sent, as opportunity offered, by Warren Hastings, to the Governor of Bombay, and was considered a very acceptable present. On reception, the members of the council were invited to dine with the governor, to partake of the rare vegetable. Somehow or other, the potato was introduced into Guzerat, and, in process of time, Bombay became well supplied with it;

so well, that the market had ever an abundance at a low price, and very good. This may imply a lapse of twenty years; and then, when the Bengal and Madras armies rendezvoused at Bombay, on their way to Egypt, every transport was supplied with as many potatoes as the captains would take.

The General in command of the army of Egypt, who superintended all its equipments, although he did not go with it (Sir Arthur Wellesly), was much struck with the resources of Bombay, and, among other things, with this unbounded supply of potatoes; and it struck him that they might be advantageously grown in Mysore. He condescended to confer with the writer of this, who happened to know something of the soil and climate of Mysore; and the result was, sending, at Sir Arthur's expense, 500 baskets of potatoes, each weighing 14 lbs., to the President of Mysore, with instructions as to the distribution of them for seed, the cultivation, &c.; and now, potatoes are as good, as plentiful, and as cheap, in Mysore as in Bombay, or in any other place. (*Gard. Chron.*, 1842, 621.

Potatoes are now grown also in the Bermudas, and other islands of the West Indies, and for excellence of quality they equal any known in Europe.

This should encourage the West India planters to turn their attention to the cultivation of potatoes, rather than yams, which are not nearly so nutritive.

BOTANICAL CHARACTER.

The potato first received the botanical names which it still retains from Caspar Bauhine, and not from Gerard, as previous writers have usually considered. *Solanum,* its generic name, seems most reasonably derived from *solor,* to assuage or comfort; because the nightshade, which first received the name, was known to the ancient herbalists who conferred it, as a narcotic plant. *Tuberosum,* the specific name, has reference to the form of its roots.

The following are its specific characteristics:—*Stems,* from nine to thirty-six inches high, somewhat angular, striated, slightly hairy, frequently purple spotted, branched. *Leaves,* interruptedly pinnate, having three or four pairs of leaflets, with smaller ones between, and one at the end larger than the rest; leaflets somewhat hairy, green colour darkest on upper surface. *Flowers,* white, somewhat tinged with purple, and in some varieties cream colour. *Fruit,* a round berry, size of a small plum; light green at first, becoming darker and almost black as it ripens. *Seeds,* numerous, small, flat, roundish.

The potato belongs to the pentandria monogynia class and order of the Linnæan system, and to the solonaceæ of the natural arrangement. The baneful nightshade (Solanum dulcamara) is the type of this group of allied plants; and they all, in a varied degree, partake of its evil qualities, though often under a fairer form. The active poisonous principle of the nightshade is known to chemists as *solanin,* and they have detected it in some one part or more of the whole group. From every species of the solanum, datura, solandra, capsicum, hyoscyamus, nicotiana, petunia, brugmansia, atropa, and mandragora, it has been extracted, and the smell of many others betrays their possession of the same subtle poison. It is no just cause for alarm that the potato is the relative of such deleterious plants; for it is one of the provisions of Providence, the wisdom of which is apparent even to the limited conception of man, that in this world we should have to learn to select the good from its associated evil. The viper's poison and the viper's fat—the sting and the honey of the bee—the tapioca and arrow-root from the most poisonous of plants—are only other examples of the same lesson taught by the facts, that the berries of the capsicum and the tomato, and the tubers of the potato, are wholesome, whilst their uncooked leaves are slightly deleterious, and the most acrid of poisons pervades the whole frame of their congeners, the nightshade, the stramonium, the deadly nightshade, the henbane, and the tobacco.

It is generally considered that the tubers of the potato are a portion of its root; and as they are produced below the soil, it will probably be long before they are otherwise regarded. The appellation, however, is not correctly applied. A root, justly defined, is that portion of a plant which imparts to it nourishment from the earth, whereas the very contrary occurs in the potato tubers, for these derive the whole of their nourishment from the plant, but yield it nothing in return. M. Decandolle coincides with Dunal and others in the opinion that the tubers of the potato are in reality developments along the lower branches of the stem buried underground.

The truth of this statement was demonstrated by the experiments of that great vegetable physiologist, the late Mr. Knight, from some of whose experiments the following are extracted. The buds in tuberous-rooted plants beneath the ground were formed, in his opinion, exclusively from matter descended from the leaves of the plant through the bark. He states that, "having raised some plants of the potato in a situation well adapted to my purpose, I waited till the tubers were about half grown; and I then commenced my experiment by carefully intersecting with a sharp knife the runners which connect the tubers with the parent plant, and immersing each end of the runners thus intersected in a decoction of logwood. At the end of twenty-four hours I examined the state of the experiment; and I found that the decoction had passed along the runners in each direction, but I could not discover that it had entered into any of the vessels of the parent plant. This result I had anticipated; because I concluded that the matter by which the growing tuber is fed must descend from the leaves through the bark; and experience had long before taught me that the bark would not absorb coloured infusions. I now endeavoured to trace the progress of the infusions in the opposite direction, and my success here much exceeded my hopes.

"A section of potato presents four distinct substances: the internal part, which, from the mode of its formation and subsequent office, I conceive allied to the alburnum of ligneous plants; the bark which surrounds this substance; the true skin of the plant; and the epidermis. Making transverse sections of the tubers which had been the subjects of experiments, I found that the coloured infusion had passed through an elaborate series of vessels between the cortical and alburnous substances, and that many minute ramifications of these vessels approached the external skin at the base of the buds, to which, as to every other part of the growing tuber, I conclude they convey nourishment.

"There is also in the young tuber a transparent line through the centre, which is probably its medulla. The buds and runners sprang from the substance which I conceive to be the alburnum of the root, and neither from the central part of it, nor from the surface in contact with the bark.

How entirely the tubers depend upon the parent plant for their formation is also shown by the following facts. Every gardener knows that early varieties of the potato never afford either blossom or seeds; and I attributed this peculiarity to privation of nutriment, owing to the tubers being formed preternaturally early, and thence drawing off that portion of the true sap which, in the ordinary course of nature, is employed in the formation of blossoms and seeds. I therefore planted in garden pots, in the last spring, some cuttings of a very early variety of the potato, which had never been known to blossom, having heaped the mould as high as I could above the level of the pots, and planted the portion of the root nearly at the top of it. When the plants had grown a few inches high, they were secured to strong sticks, which had been fixed erect in the pots for that purpose, and the mould was then washed away from the base of their stems by a strong current of water.

Each plant was now suspended in air, and had no communication with the soil in the pots, except by its fibrous roots; and as these are perfectly distinct organs from the runners which generate and feed the tuberous roots, I could readily prevent the formation of them. Efforts were soon made by every plant to generate runners and tuberous roots; but these were destroyed as soon as they became perceptible. An increased luxuriance of growth now became visible in every plant; numerous blossoms were emitted, and every blossom afforded fruit. Conceiving, however, that a small portion only of the true sap would be expended in the production of blossoms and seeds, I was anxious to discover what use nature would make of that which remained; and I, therefore, took effectual means to prevent the formation of tubers on any part of the plants, except the extremities of the lateral branches, those being the points most distant from the earth, in which the tubers are naturally deposited. After an ineffectual struggle of a few weeks the plants became perfectly obedient to my wishes, and formed their tubers precisely in the places I had assigned them. Many of the joints of the plants during the experiment, became enlarged and turgid, and I am much inclined to believe, that if I had totally prevented the formation of regular tubers, these joints would have acquired an organization capable of retaining life, and of affording plants in the succeeding spring. I had another variety of the potato, which grew with great luxuriance, and afforded many lateral branches; and just at that period, when I had ascertained the first commencing formation of the tubers beneath the soil, I nearly detached many of these lateral branches from the principal stems, letting them remain suspended by such a portion only of alburnous, and cortical fibres and vessels, as were sufficient to preserve life. In this position I conceived that, if their leaves and stems contained any unemployed true sap, it could not readily find its way to the tuberous roots, its passage being obstructed by the rupture of the vessels, and by gravitation ; and I had soon the pleasure to see, that instead of returning down the principal stem into the ground, it remained and formed small tubers at the base of the leaves of the depending branches."

Mr. Knight illustrated these facts still further, by an experiment he thus details :—

"Leaves of the potato, without any portion of bark being attached to them, were taken from the plants, just at the period when the tuberous root began to be formed ; and I conceived that these leaves, consistently with my former experiments and conclusions, must contain portions of the living organisable matter, which would subsequently have been found in their tuberous roots. The leaves were, therefore, planted in pots, and placed under glass, where, being regularly and properly supplied with water, they continued to live till winter, though without emitting fibrous roots ; and I then expected to find some small tubers at their bases. In this expectation I was disappointed ; but the result of the experiment was not less satisfactory, the bases of the leaf-stalks themselves having swollen into conic bodies of more than two inches in circumference, and being found to consist of matter apparently similar to that which composes the tuberous roots of the plant. The enlarged parts of the leaf-stalks remained alive in the following spring; but whether they are capable of generating buds or not, I have not been able to ascertain." (*Knight's Physiological and Horticultural Papers*, 126-169.)

CHEMICAL COMPOSITION.

It has been stated, whilst considering the botanical and physiological characters of the potato, that the poisonous constituent, characterising the family of which it is a member, is not absent from the potato. Solanin was first detected in its berries, by M. Desfosses; subsequently in its tubers, after they had sprouted, by M. Otto; and in its sap, by M. Buchner.* Solanin, or solanina, is a vegetable alkali, having the form of a white powder, and unites readily with acids, forming salts, having peculiar and distinct properties. Both itself and its saline compounds are acrid poisons. Two grains of the sulphate of solanin given to a rabbit, caused its death in a few hours, preceded by paralysis of the hind extremities.

* Journ. de Pharm. vi. 374. Ann. de Chym. liii. 412. Jahres-Bericht for 1835, p. 286.

Solanin, according to the analysis of M. Blanchet, is composed of—

Carbon	.. ..	58·67
Hydrogen	.. ..	8·96
Azote (Nitrogen)	..	1·64
Oxygen	.. ..	30·73
		100·00*

This fact of sprouted potatoes containing solanin, suggests caution in their use in a raw state as the food of animals. It is also probable that they are not so wholesome as others unsprouted, even after they have been cooked, though the exposure to a high temperature effects a great change in their composition.

Besides the above peculiar product of the solanaceæ, potatoes contain many others; the chief and most important of which is starch.

The following table exhibits the constituents of different varieties of potatoes, according to the analyses of Einhof, Lampadius, and Henry, jun.:–

* Ann. de Chym. vii. 414.

Kinds.	Starchy Fibrin.	Starch.	Albumen.	Gum.	Acids and Salts.	Water.
Red potato . .	7·00	15·00	1·40	4·1	5·1	75
Ditto, after budding .	6·80	15·20	1·30	3·7		73
The buds, or germs .	2·80	0·40	0·40	3·3		93
Great red potato .	6·00	12·90	0·70			78
Kidney ditto . .	8·80	9·10	0·80			81·3
Sweet ditto . .	8·20	15·10	0·80			74·3
Peruvian potato .	5·25	15·00	1·88	1·87		76
English ditto . .	6·83	12·91	1·04	1·70		77·8
Onion ditto . .	8·38	18·75	0·9	1·66		70·3
Voichland ditto .	7·13	15·41	1·25	1·95		74·3
Paris ditto . .	6·79	13·3	0·92	1·4		73·12

Besides the substances detected by Einhof and Lampadius, Vauquelin discovered, in the expressed juice of the potato, about 0·1 per cent. of crystallized asparagin; about 0·4 or 0·5 per cent. of a substance containing azote, similar to gum, and not precipitated by tannin; a soft resin, which, when heated, emits an agreeable smell; an extractive substance, which becomes black when exposed to the air; citric acid; citrates of potash and lime; and phosphates of the same bases. Baup informs us, that potatoes, after they begin to grow, contain a small quantity of solanin. As it may be useful to know the quantity of starch furnished by different varieties of potato, the following table, drawn up from the experiments of Mr. William Skrimshire, jun., is subjoined, although much fuller information on this point is given in the chapter on the varieties of the potato. Five pounds avoirdupois of fresh potatoes were used, and the starch was separated by grating the potato, and pouring water upon it, placed upon a searce.

Substances.	Captain Hart.	Rough Red	White Kidney.	Moulton White.	Yorkshire Kidney.	Hundred Eyes.	Purple Red.	Ox Noble.
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz	lb. oz.
Fine starch	0 · 9	0·7¼	0·0	0 · 9	0 · 8¾	0·8¼	0·8	0 · 6½
Do. slightly coloured..	0 · 3	0·3¼	0·9½	0 · 2¾	0 · 2½	0·0¾	0 0½	0 · 1¾
Pulp, dried	0 · 6	0·6½	0·3¾	0 · 5¾	0 · 6½	0·6¾	0·5	0 · 8
Water, mucus, and extractive	3 · 14	3.15	4·2¾	3·14½	3·14¼	4·0¼	4·2½	3·15¾
Total .	5 · 0	5 · 0	5 · 0	5 · 0	5 · 0	5 · 0	5 · 0	5 · 0

When potatoes are exposed to the action of frost, it is well known that they become soft, and acquire a sweet taste. This taste is succeeded by sourness, owing to the rapid evolution of acetic acid, and the root soon passes into putrefaction. From the experiments of Einhof, we learn that the sugar is formed at the expense of the mucilage, for the other ingredients were found, in potatoes sweetened by frost, in the usual proportions. He considers this sweetening process as connected with the vegetative powers of the root. When potatoes are boiled, they lose from one to one and a half per cent. of their weight. The juice, which may be separated from them, is sweet-tasted.

The meal is insoluble even in boiling water, though potato starch forms a transparent solution with hot water. Thus it appears that, by boiling the albumen, fibrous matter and starch combine together, and form an insoluble compound. From these experiments it is evident that potatoes differ essentially from wheat and barley, by containing no gluten. They approach, in some measure, to the nature of rye.

Dr. Peschier, of Geneva, has detected the presence of mucus, sugar, and of gum, in the potato. This explains why they are capable of undergoing the vinous fermentation.*

The *stems* and *leaves* of the potato have also been analysed; and, according to the experiment of M. Sprengel, 100,000 parts of the air-dried herbage of ripe potatoes contain of mineral substances—

* Thomson's Vegetable Chemistry, 840.

0·801	parts of	silica
2·918	„	lime
0·488	„	magnesia
0·138	„	potash and soda
0·052	„	alumina
0·058	„	oxide of iron
0·044	„	oxide of manganese
0·032	„	phosphoric acid
0·245	„	sulphuric acid
0·010	„	chlorine
4·786	parts of	mineral substances.

Since 100lbs. of ripe potato herbage contain nearly 4lbs. of mineral substances beneficial to vegetation, it follows that this kind of haulm is more valuable as a manure than it has been hitherto considered; and that it ought to be conveyed either to the stables or the dunghill; more especially as it is rich in nitrogen; Boussingault having found 23lbs. of nitrogen in 1000lbs. of dry potato straw. Therefore, from 3000lbs. of potato haulm one Magdeburg acre of land will receive 69lbs. of nitrogen, which is by itself a powerful manuring agent. The green herbage of potatoes contains still more mineral matter, especially potash. The woodiness of potato straw renders it difficult to decompose. If it is placed at the bottom of the dunghill, where it is too wet, and excluded from the action of the atmosphere, it will be taken to the land in an undecayed state. It is therefore better to pack it in the middle of the dunghill, so that it may become sooner decomposed by the heat of fermentation. (*Gard. Chron.* 1843. 263.)

The *ashes* of the tubers of potatoes have also been examined, and consist, according to M. Vogel, of 17·5 per cent. insoluble and 82·5 soluble salts. The former consist of 9 per cent phosphate of lime, with some phosphate of magnesia, alumina, and peroxide of iron, and of 8·5 per cent. carbonate of lime, with some carbonate of magnesia; there is no silica present. The latter consist principally of alkaline carbonates, sulphates and phosphates (5·33 phosphates, 6·93 sulphates), and traces of metallic chlorides. The soda constantly amounts to 1 per cent. more than the potash. (*Ann. de Chym. et Pharm.* xlix. p. 245.)

Still more recently Mr. Solly has published the following analysis of healthy specimens of the bread-fruit potato:

Starch	13,020
Gum (little sugar) . . .	3,650
Fibre	4,000
Albumen	,950
Gluten	1,150
Resin and wax	,750
Water	75,161

Potash and soda, with organic acids	,982
„ „ sulph. acid .	,48
„ „ chlorine .	,67
Earthy phosphates	,163
Lime	,17
Magnesia	,24
Oxide of iron	,9
Silica	,6
	100,000

The following are comparative analyses of the same variety, grown on the same kind of soil for successive years :

	1842.	1843.	1845.
Starch . . .	1074	1383	1004
Fibre . . .	652	685	482
Gum and resin .	504	284	266
Albumen . .	87	80	86
Gluten . . .	103	121	100
Water . . .	7610	7447	8063
	10000	10000	10000

The following table has been drawn up for the purpose of affording a view of the relative merits of potatoes grown from seeds and tubers :

is too wet, and excluded from ... mosphere, it will be taken to th ... state. It is therefore better ... of the dunghill, so that it r ... posed by the heat of fe ... 1843. 263.)

The *ashes* of the t ... examined, and cor ... 17·5 per cent. in ... former consist c ... some phosph ... of iron, and ... some carb ... sent. T ... bonate ... 6·9? ... so ...

			nt.	per cnt.	
			$6\frac{1}{4}$	25	$68\frac{3}{4}$
		2	9	30	61
	92	82	$6\frac{1}{2}$	19	$74\frac{1}{2}$
...m .	104	91	8	23	69
...y kidneys ...m tubers .	93	90	6	20	74
The same from seed . .	106	94	$9\frac{3}{4}$	25	$65\frac{1}{4}$

As these three sorts of potatoes were grown in soil of equal goodness, and received the same treatment, they prove very satisfactorily the advantageousness of the raising the potatoes from seed. *(W. Albert's Facts on the Renovation of the Potato. Magdeburg.* 1845.)

The next table shews that the potato is in its most wholesome and nutritive state in November; for 240lbs. of potatoes were found to contain, of starch:

	lbs.		lbs.		
In August . .	23	to	25	or	9·6-10·4 per cent.
In September .	32	to	68	or	13·3-16·0 ,,
In October . .	32	to	40	or	13·3-16·6 ,,
In November .	38	to	45	or	16·0-18·7 ,,
In April . . .	38	to	28	or	16·0-11·6 ,,
In May . . .	28	to	20	or	11·6- 8·3 ,,

VARIETIES.

Varieties may wear out and become extinct, but a species never. The one is a result of man's ingenuity and caprice, the latter is the work of God. Thus the varieties of the pelargonium come forth from the florist's nursery annually, flourish for a few years, and are obliterated; but the pelargonium remains unchanged, and may be now gathered on the sides of Table Mountain as unchanged as it was when Vasca de Gama first reached the Cape of Good Hope. It is so also with the potato: its varieties are numerous; every seedling produces tubers differing somewhat from those of the parent plant: and cultivation increases more widely the variance. These varieties may change, wear out, and become worthless; but the parent, the wild solanum tuberosum, remains, may be improved by culture, and be the fruitful parent of new varieties to the end of time.

The characteristics of a good variety are a robust square stem, about 18 inches high; branches none, or very few; leaves large, dark green, rough, and slightly hairy. Tuber-bearing runners few, stout, and with no more than one or two tubers on each. The real roots numerous, very fibrous, and widely-spreading. The tubers regular-sized; eyes few, and slow to germinate; skin rough; when cooked, dry and mealy.

In the following list are enumerated only such varieties as may be now obtained, and the qualities of which are derived from good authorities. It is chiefly extracted from Messrs. Lawson's *Agriculturist's Manual*, a work too little known. In speaking of their excellence, praise is given accordingly as they boil mealy; that is, in proportion to the abundance of starch which they contain.

FOR FORCING, AND EARLIEST OPEN GROUND CROPS.

Walnut-leaved Kidney. Earliest. Tubers, about the size of pigeons' eggs, form in a cluster, close to the set; in the open grounds, ready for table, early in May, and even April. I question whether this is not the kidney-bean potato, used whole for stews at Paris.

Fox's Early Delight. Height of stem, 1½ foot; upright; leaves, dark green, rough, and crowded;

no flowers; tubers, round, white, slightly hollow at the ends; skin, slightly rough, netted-like; increase, 13 fold; mealy, superior flavour, healthy; starch, 610 grains in 1lb. of tubers.

Fox's Early Globe. Height of stem, 1 foot; slender, reclining; leaves, light green, long, and drooping; no flowers; tubers, round, white, few-eyed; skin, slightly rough, netted-like; increase, 8 fold; mealy, good flavour, healthy; starch, 575 grains in 1lb. of tubers.

Williamson's Favourite. Height of stem, 1½ foot; slender, reclining; leaves, light green; no flowers; tubers, slightly elongated, white; skin, smooth; increase, 6 fold; mealy, good flavour, healthy; starch, 678 grains in 1lb. of tubers.

Dwarf Early Frame. Height of stem, 1 foot; slightly reclined; leaves, light green, close, round, and wrinkled; no flowers; tubers, small, white, round; skin, smooth; increase, 5 fold; waxy, inferior flavour, rather unhealthy; starch, 418 grains in 1lb. of tubers. Sometimes called *Early* Warwick.

Common Early Frame.—Height of stem, 1¼ foot; slightly reclined; leaves, medium, smooth, and light green; no flowers; tubers, medium sized, round, white; skin, roughish; increase, 7 fold; mealy, good flavour, healthy; starch, 393 grains in 1lb. of tubers.

Foxly. Height of stem, 1¼ foot; spreading;

leaves, light green; no flowers; tubers, irregularly round, white, and small; skin, very smooth; increase, 6 fold; waxy, inferior flavour, unhealthy; starch, 393 grains in 1lb. of tubers.

Ross's Early. Height of stem, 1½ foot; spreading; leaves, light green, dense, and rough; no flowers; tubers, round, white, medium-sized; skin, smooth; increase, 16 fold; mealy, good flavour, very unhealthy; starch, 591 grains in 1lb. of tubers.

London Dwarf Kidney. Height of stem, 1 foot; slender, reclining; leaves, loose, long, light green, recurved at edges; no flowers; tubers, oblong, white, flat, thickest near the point, eyes prominent; skin, smooth; increase, 15 fold; waxy at small end, indifferent flavour, pretty healthy; starch, 350 grains in 1lb. of tubers.

Fox's John Bull, or Early Kidney. Height of stem, 1¼ foot; slender, reclining; leaves, loose, long, light green, recurved at edges; no flowers; tubers, white, long, of nearly uniform thickness; skin, smooth; increase, 13 fold; pretty mealy, good flavour, and healthy; starch, 543 grains in 1lb. of tubers.

EARLIEST OPEN-GROUND POTATOES, TOO TALL FOR FORCING.

Ash-leaved Kidney. But little later than the walnut-leaved, superior in quality and size; raised by

Holbery, a shoemaker at Retford, Nottinghamshire, about 40 years ago, from seed of the mouse kidney. *Gard. Chron.* 1844, 462.

Cornish Kidney. Very good, and early in Cornwall, and good keepers; but in Hampshire they did not succeed with me.

Early Seedling. Height of stem, 2 feet; slender, straggling; leaves, light green, smooth, and shining; no flowers; tubers, round, few-eyed; skin, very white, smooth; increase, 10 fold; mealy, superior flavour, very healthy; starch, 615 grains in 1lb. of tubers.

London Early Round. Height of stem, 2 feet; rather upright and compact; leaves, dark green, very rough, and wrinkled-like; no flowers; tubers, large, round, with small deep eyes; skin, roughish; increase, 9 fold; mealy, good flavour, rather liable to curl; starch, 584 grains in 1lb. of tubers.

Musgrove's Snow White. Height of stem, 2 feet; rather upright and compact; leaves, roughish; no flowers; tubers, round, or hollow at the point; skin, remarkably white, rough, and netted; medium, good flavour, very healthy; starch, 592 grains in 1lb. of tubers.

London Particular. Height of stem, 2 feet; rather upright and compact; leaves, light green, roughish; no flowers; tubers, round, or slightly elongated; skin, roughish; increase, 8 fold; medium, good flavour, very healthy; starch, 575 grains in 1lb. of tubers.

Ash-leaved Early. Height of stem, $1\frac{3}{4}$ foot; upright and loose; leaves, long, smooth, shining, and drooping; no flowers; tubers, roundish; skin, roughish; increase, 9 fold; ditto, medium flavour ditto; starch, 547 grains in 1lb. of tubers.

Hopetoun Early. Height of stem, 2 feet; stems strong, upright; leaves, roughish and wrinkled; no flowers; tubers, large, round, with few eyes; skin, dull, white, rough, netted-like; increase, 13 fold; mealy, good flavour ditto; starch, 592 grains in 1lb. of tubers.

Chapman's Early. Like the German woren.

Invermay Early. Height of stem, $1\frac{3}{4}$ foot; spreading; leaves, small, and recurved at the edges; no flowers; tubers, round; skin, very white, smooth; increase, 10 fold; mealy, good flavour, very healthy; starch, 610 grains in 1lb of tubers.

Manly. Height of stem, $1\frac{3}{4}$ foot; spreading; leaves, rather small; no flowers; tubers, round, pretty large; skin, white and smooth; increase, 12 fold; mealy, good flavour, not very healthy; starch, 450 grains in 1lb. of tubers.

Magnificent Kidney. Height of stem, $1\frac{3}{4}$ foot; rather upright and compact; leaves, small, light green, and rather rough; no flowers; tubers, small, not very oblong; skin, white and smooth; increase, 6 fold; mealy, good flavour, apt to curl; starch, 613 grains in 1lb. of tubers.

New Elm-leaved ditto. Height of stem, $1\frac{3}{4}$ foot; rather upright and compact; leaves, broad and rough; no flowers; tubers, smallest towards the stalk; skin, white and smooth; increase, 7 fold; medium flavour, pretty healthy; starch,* 403 grains in 1lb. of tubers.

Dryden's Early Kidney.—Height of stem, $1\frac{3}{4}$ foot; pretty upright; leaves, roughish, dark green; no flowers; tubers, large, with few and prominent eyes; skin, slightly rough; increase, 8 fold; mealy, medium flavour, pretty healthy; starch, 506 grains in 1lb. of tubers,

Kay's Early American.—Height of stem, $1\frac{1}{2}$ foot; slender, spreading; leaves, light green, smoothish, and lightly shining; no flowers; tubers slightly oblong, flattish; skin, light red, roughish; increase, 10 fold; mealy, medium flavour, very healthy; starch, 590 grains in 1lb. of tubers.

FOR SECOND EARLY CROP.

Early Champion.—Height of stem, 2 feet; rather upright and compact; leaves, dark green, short, and wrinkled-like; flowers, light purple, tipped green; tubers, round, eyes few, small, and deep; skin, very rough, netted-like; increase, 12 fold; mealy, medium flavour, pretty healthy; starch, 459 grains in 1lb. of tubers.

Dwarf Amer, Early.—Height of stem, 1 foot; pretty upright; leaves, light green, roughish; no flower; tubers, slightly flattened; skin, white and rough; increase, 13 fold; mealy, good flavour, pretty healthy; starch, 594 grains in 1lb. of tubers.

Dutch Early.—Height of stem, 1½ foot, very upright, compact; leaves, darkish green, rough; flower various, white, light purple, and reddish; tubers small, with large eyes, often pointed; skin, white and smooth; increase, 12 fold; rather waxy, indifferent flavour, very healthy; starch, 487 grains in 1lb. of tubers.

Early Wellington.—Height of stem, 1¼ foot; slender, spreading; leaves, slightly recurved; no flower; tubers, round; skin, yellowish white, and very rough; increase, 10 fold; mealy, good flavour, very healthy; starch, 492 grains in 1lb. of tubers.

Early Cluster.—Height of stem, 1¼ foot; slender, spreading; leaves, light green, large, close; no flower; tubers, round; skin, rough, apt to crack; increase, 8 fold; mealy, good flavour, rather unhealthy; starch, 486 grains in 1lb. of tubers.

Seek no Further.—Height of stem, 1½ foot; compact, bushy; leaves, light green, large, rough; no flower; tubers, round; skin, white, rough, and slightly netted; increase, 14 fold; mealy, good flavour, healthy ; starch, 540 grains in 1lb. of tubers.

Prince of Wales' Early.—Height of stem, 2 feet; strong, upright; leaves, lightish green, dense, and rough; no flower; tubers, large, slightly oblong, and flat; skin, white and smooth; increase, 15 fold; rather mealy, good flavour, very healthy; starch, 520 grains in 1lb. of tubers.

Tall American Early.—Height of stem, 2 feet; strong, and pretty upright; leaves, loose, and lightish green; flower, whitish; tubers, flattened; skin, very white and rough; increase, 12 fold; mealy, good flavour, very healthy; starch, 577 grains in 1lb. of tubers.

Early Prolific—Height of stem, $1\frac{1}{2}$ foot; slender, spreading; leaves, large, lightish green; no flower; tubers, very small and round; skin, roughish and nettled; increase, 14 fold; mealy, good flavour, pretty healthy; starch, 498 grains in 1lb. of tubers.

Lawhead Early White.—Height of stem, $1\frac{1}{2}$ foot; rather slender, spreading; leaves, light green and loose; no flower; tubers, rather large; skin, very rough and netted; increase, 14 fold; mealy, good flavour, pretty healthy; starch, 519 grains in 1lb. of tubers.

New Early Windsor Seedling. Height of stem, $1\frac{1}{4}$ foot; rather slender, spreading; leaves, long and loose; no flower; tubers, round; skin, white and smoothish; increase, 12 fold; mealy, good flavour, very healthy; starch, 484 grains in 1lb. of tubers.

Shaw's Early. Height of stem, 2 feet; rather strong, upright; leaves, roughish and large; seldom flowers; tubers, large, irregular, round; skin, dull white, very rough; increase, 11 fold; rather waxy, medium flavour, pretty healthy; starch, 562 grains in 1lb. of tubers.

Matchless Kidney. Height of stem, 1¼ foot; upright, compact; leaves, short and dark green; no flower; tubers, eyes few and prominent; skin, white, and smooth; increase, 9 fold; mealy, superior flavour, healthy; starch, 603 grains in 1lb. of tubers.

Ross's Pigmy Kidney. Height of stem, 1 foot; spreading; leaves, dark green; flowers, light purple; tubers, small, long, and crooked, and few eyed; skin, roughish; increase, 10 fold; mealy, superior flavour, medium healthy. Starch, 457 grains in 1lb. of tubers.

Musgrove's Giant Kidney. Height of stem, 1½ foot; rather upright; leaves, rough and light green; flower, white; tubers, large, long, and thick; skin, white and roughish; increase, 7 fold; mealy, good flavour, very subject to curl; starch, 585 grains in 1lb. of tubers.

Cape of Good Hope Kidney. Height of stem, 1¼ foot; rather upright; leaves, rough, and light green;

seldom flowers; tubers, large, crooked, and slightly flattened; skin, white, and roughish; increase 8 fold; mealy, superior flavour, very subject to curl; starch, 592 grains in 1lb. of tubers.

White Sutherland Kidney. Height of stem, $1\frac{3}{4}$ foot; very upright, compact; leaves, dark green, short, and reflexed; flower, white; tubers, curved, flat, and smallest towards the stalk; skin, rough and netted; increase, 11 fold; mealy, good flavour, healthy; starch, 532 grains in 1lb. of tubers.

Painted Lady, Early.—Height of stem, $1\frac{1}{2}$ foot; upright, compact; leaves, short, small, and rough; no flowers; tubers, irregularly round; skin, white and reddish; increase, 8 fold; rather waxy, medium flavour, healthy; starch, 484 grains in 1lb. of tubers.

Purple Skinned, Early.—Height of stem, 1 foot; dwarf and bushy; leaves, small and rough; seldom flowers; tubers, small and round; skin, purplish; increase, 7 fold; medium flavour, very subject to curl; starch, 570 grains in 1lb. of tubers.

Taylor's Forty-fold. Height of stem, $1\frac{1}{2}$ foot; slender, spreading; leaves, light green; seldom flowers; tubers, oval, much flattened; skin, rough and dull reddish; increase, 20 fold; mealy, superior flavour, healthy; starch, 502 grains in 1lb. of tubers. [It is a native of Lancashire, raised from two red tubers, accidentally produced by a plant of Kemp's, which is a white potato. They were taken to Mr.

Taylor, nurseryman, of Preston, who raised stock from them. *Gard. Chron.* 1841, 814.]

Lawhead Early Red. Height of stem, 2 feet; slender, spreading; leaves, dark green; seldom flowers; tubers, very round; skin, dark red and roughish; increase, 15 fold; mealy, good flavour, healthy; starch, 490 grains in 1lb. of tubers.

EARLY FIELD POTATOES.

Dickson's Early. Height of stem, $2\frac{1}{2}$ feet; rather upright; leaves, very light green; flower, light purple; tubers, flattened, with pretty deep eyes; skin, dull white; increase, 13 fold; rather waxy, indifferent flavour, a healthy and free grower; starch, 587 grains in 1lb. of tubers.

Aberdeen Favourite, or Possie's. Height of stem, 2 feet; stout and bushy; leaves, large and close; flowers, white; tubers, flattened and oval; skin, rather smooth and white; increase, 13 fold; mealy, good flavour, very healthy; starch, 762 grains in 1lb. of tubers.

Late Prolific. Height of stem, $1\frac{3}{4}$ foot; loose and straggling; leaves, thinned, scattered-like; flowers, very light purple; tubers, small and round; skin, very white; increase, 15 fold; mealy, good flavour, subject to curl; starch, 495 grains in 1lb. of tubers.

Paterson's White. Height of stem, $1\frac{3}{4}$ foot; rather upright; leaves, darkish green; flowers, very light purple; tubers, rather hollowed at the ends; skin, white and smooth; increase, 13 fold; mealy, goodish flavour, very subject to curl; starch, 560 grains in 1lb. of tubers.

Gamekeeper's Round White. Height of stem, $2\frac{1}{2}$ feet; spreading; leaves, large, rough, and light green; flower, whitish; tubers, slightly flattened; skin, dull white, rough, and netted-like; increase, 18 fold; mealy, good flavour, pretty healthy; starch, 608 grains in 1lb. of tubers.

Quebec Profit. Height of stem, $2\frac{3}{4}$ feet; upright, compact; leaves, large, rough, and light green; flower, very light purple; tubers, rather large, oblong, slightly flattened; skin, roughish; increase, 18 fold; waxy, indifferent flavour, healthy; starch, 487 grains in 1lb. of tubers.

Old Flat White. Height of stem, $2\frac{1}{2}$ feet; strong and slightly spreading; leaves, large, lightish green; flowers, whitish; tubers, slightly oblong, much flattened; skin, very white, smooth; increase, 16 fold; mealy, very superior flavour; healthy; starch, 830 grains in 1lb. of tubers.

Leather-coat. Height of stem, $2\frac{1}{2}$ feet; strong, and slightly spreading; leaves, large, lightish green; flowers, whitish; tubers, slightly oblong, much flattened; skin, yellowish white, and remarkably rough; increase, 13 fold; mealy, superior flavour, healthy; starch, 790 grains in 1lb. of tubers.

Walls of Great Britain. Height of stem, $2\frac{1}{2}$ feet; stiff and upright; leaves, reflexed and compact; flowers, whitish; tubers, broadish, slightly flattened near the point; skin, pretty smooth; increase, 15 fold; mealy, superior flavour, very healthy; starch, 684 grains in 1lb. of tubers.

Yellow Round. Height of stem, $2\frac{1}{2}$ feet; rather upright and compact; leaves, very light green; flowers, purplish; tubers, often smallest towards the stalk, eyes deep; skin, yellowish, and very smooth; increase, 13 fold; rather waxy, indifferent flavour, very healthy; starch, 503 grains in 1lb. of tubers.

Lark. Height of stem, 2 feet; spreading; leaves, large, loose, and light green; flowers, light purple; tubers, often smallest towards the stalk, eyes deep; skin, yellowish, and very smooth; increase, 12 fold; rather mealy, indifferent flavour, very healthy; starch, 687 grains in 1lb. of tubers.

Peruvian. Height of stem, 2 feet. Rather upright and compact. Leaves, smooth and slightly shining. Flowers, light purple. Tubers, round, rather small. Skin, dull white, rough, and liable to crack. Increase, 10 fold. Indifferent flavour, rather unhealthy. Starch, 656 grains in 1lb. of tubers.

Dodd's Seedling. Height of stem, $2\frac{1}{2}$ feet. Slender, spreading. Leaves, light green. Flowers, light purple. Tubers, slightly oblong, with deep eyes.

Skin, white and smooth. Increase, 12 fold. Medium good flavour, healthy. Starch, 573 grains in 1lb. of tubers.

Late Champion. Height $1\frac{1}{2}$ foot. Rather upright and compact. Leaves rough. Flowers, whitish. Tubers, roundish, rather large. Skin, dull and white. Increase, 11 fold. Medium good flavour, rather subject to curl. Starch, 745 grains in 1lb. of tubers.

Roasting. Height of stem, 2 feet. Slightly spreading. Leaves, slightly reflexed. Flowers, very light purple. Tubers, slightly oblong, with many eyes. Skin, roughish. Increase, 18 fold. Waxy, bad flavour, pretty healthy. Starch, 480 grains in 1lb. of tubers.

Late White. Height of stem, $2\frac{3}{4}$ feet. Stems upright. Leaves, light green and loose. Flowers, whitish. Tubers, slightly oblong and flattened. Skin, roughish. Increase, 13 fold. Mealy, good flavour, pretty healthy. Starch, 513 grains in 1lb. of tubers.

White Breadfruit. Height of stem, $2\frac{3}{4}$ feet. Stems upright. Leaves, light, close, and roughish. Flowers, reddish purple. Tubers, round, or slightly oblong, and flattened. Skin, roughish. Increase, 17 fold. Mealy, superior flavour, pretty healthy. Starch, 592 grains in 1lb. of tubers. Sometimes called *Farmer's Glory.* It keeps very well.

Fife White. Height of stem, $2\frac{1}{2}$ feet. Stems spreading. Leaves, round, lightish green, and reflexed. Flowers, purple. Tubers, round, or slightly oblong, and flattened. Skin, roughish. Increase, 13 fold. Waxy, medium flavour, pretty healthy. Starch, 405 grains in 1lb. of tubers.

Saunderson's Dunbar. Height of stem, 2 feet. Stems spreading. Leaves, dense and very light green. Flowers, whitish. Tubers, round. Skin, roughish, apt to crack. Increase, 16 fold. Mealy, very superior flavour, pretty healthy. Starch, 674 grains in 1lb. of tubers.

Late White American. Height of stem, $2\frac{1}{4}$ feet. Stems, pretty upright. Leaves, lightish green. Flowers, purplish. Tubers, a little oblong, flattened, with many eyes. Smooth skinned. Increase, 15 fold. Mealy, good flavour, pretty healthy. Starch, 581 grains in 1lb. of tubers.

Aberdeen White. Height of stems, $2\frac{3}{4}$ feet. Strong, upright, and compact. Leaves, light green, large, and rough. Flowers, whitish. Tubers, slightly elongated, and flattened. Smooth skinned. Increase, 13 fold. Medium, goodish flavour, pretty healthy. Starch, 540 grains in 1lb. of tubers.

Fill Basket. Height of stem, 2 feet. Loose and straggling. Leaves, lightish green. Flowers, whitish. Tubers, round. Skin, slightly rough. Increase, 14 fold. Mealy, goodish flavour, pretty healthy. Starch, 660 grains in 1lb. of tubers.

Albany Kidney. Height of stem, $2\frac{3}{4}$ feet. Strong, and rather upright. Leaves, large, crowded, and reflexed. Flowers, whitish. Tubers, large, slightly curved, flat, and broadest near the point. Skin, white and roughish. Increase, 16 fold. Mealy, superior flavour, very healthy. Starch, 498 grains in 1lb. of tubers.

Rafford Kidney. Height of stem, $1\frac{3}{4}$ foot. Straggling. Leaves, smoothish, light green. No flowers. Tubers, straight, white, and about equal in breadth, throughout small. Smooth skinned. Increase, 10 fold. Mealy, goodish flavour, rather subject to curl. Starch, 633 grains in 1lb. of tubers. Sometimes called the *Lady's Finger.*

Early Field Kidney. Height of stem, 2 feet. Upright and compact. Leaves dark green, and reflexed. Flowers, whitish. Tubers, small towards the stalk, and flattened. Very rough skinned. Increase, 15 fold. Medium flavour, good, very healthy. Starch, 442 grains in 1lb. of tubers.

Variably Shaped Kidney. Height of stem, 2 feet. Weak and spreading. Leaves loose and drooping. Flowers, light purple. Tubers, variable, nearly round, and long. Skin, very white and smooth. Increase, 14 fold. Flavour good, medium healthy. Starch, 480 grains in 1lb. of tubers.

Imperial Kidney. Height of stem, $2\frac{3}{4}$ feet. Strong, upright, and rather close. Leaves, rather small. Flowers, whitish. Tubers, straight and slightly flattened. Skin, roughish. Increase, 18 fold. Rather mealy, medium flavour, pretty healthy. Starch, 408 grains in 1lb. of tubers.

Bevisford Kidney. Height of stem, 2 feet. Pretty upright. Leaves, loose and light green. Flowers, light purple. Tubers, straight, and much flattened. Skin, roughish. Increase, 13 fold. Mealy, superior flavour, pretty healthy. Starch, 368 grains in 1lb. of tubers.

Barbadoes Kidney. Height of stem, 2¾ feet. Rather upright. Leaves, loose and light green. Flowers, light purple. Tubers, rather small, and much flattened. Skin, sometimes slightly tinged with red near the point. Increase, 10 fold. Rather waxy, goodish, pretty healthy. Starch, 672 grains in 1lb. of tubers.

Fife Blues. Height of stem, 2 feet. Spreading. Leaves, compact, rough, light geeen, and slightly reflexed. Flowers, light purple, white. Tubers, large and roundish. Skin, darkish blue, with white blotches near the stalk. Increase, 16 fold. Mealy, good flavour, pretty healthy. Starch, 529 grains in 1lb. of tubers.

Red Parroquet. Height of stem, 1¼ foot. Rather straggling. Leaves, darkish green. Flowers, whitish. Tubers, large, and much hollowed at the stalk. Skin, irregularly blotched with white and reddish purple.

Increase, 15 fold. Mealy, good flavour, pretty healthy. Starch, 483 grains in 1lb. of tubers.

Common, or Edinburgh Dons. Height of stem, $2\frac{3}{4}$ feet. Strong, spreading. Leaves, lightish green. Flowers, whitish. Tubers, round, hollow at the stalk. Skin, white, reddish purple about the eyes. Increase, 16 fold. Mealy, good flavour, pretty healthy. Starch, 576 grains in 1lb. of tubers.

Blue Dons. Height of stem, $2\frac{1}{2}$ feet. Strong, spreading. Leaves, rather darkish green. Flowers, whitish. Tubers, round, hollow at the stalk. Skin, dark bluish purple, with small whitish blotches. Increase, 15 fold. Mealy, very good flavour. Starch, 547 grains in 1lb. of tubers.

Irish Apple. Height of stem, 2 feet. Strong, spreading. Leaves, dark green, rough, and crowded. Flowers, reddish purple. Tubers, much hollowed at both ends. Skin, bright white, but light-red about the eyes. Increase, 10 fold. Mealy, very good flavour, pretty healthy. Starch, 458 grains in 1lb. of tubers.

Plough Boy. Height of stem, 2 feet. Loose and rather straggling. Leaves rough, lightish green. Flowers, light purple. Tubers, much hollowed at both ends. Skin, whitish, slightly interspersed with reddish purple about the eyes. Increase, 12 fold. Mealy, good flavour, pretty healthy. Starch, 536 grains in 1lb. of tubers.

Onion Potato. Height of stem, 2 feet. Upright. Leaves, small and crowded. Flowers, purple. Tubers, round, or very slightly oblong. Skin, purplish red, whitish towards the stalks. Increase, 13 fold. Very mealy, good flavour, rather subject to curl. Starch, 456 grains in 1lb. of tubers.

Farmer's Black Seedling. Height of stem, 2½ feet. Upright, strong, and compact. Leaves, light green, large and rough. Flowers, very light purple. Tubers, roundish. Skin, dark purple, with whitish eyes. Increase, 12 fold. Waxy, bad, very subject to curl. Starch, 849 grains in 1lb. of tubers.

Shetland Blacks. Height of stem, 2½ feet. Upright, strong, and compact. Leaves, light green, large, and rough. Flowers, very light purple. Tubers, roundish. Skin, bright purple, with whitish eyes. Increase, 11 fold. Mealy, very fine flavour, very subject to curl. Starch, 819 grains in 1lb. of tubers.

Lady Mary. Height of stem, 2 feet. Spreading. Leaves, lightish green. Flower, purplish. Tubers, often slightly oblong. Skin, reddish, small white and purplish streaks. Increase, 10 fold. Mealy, superior flavour, very subject to curl. Starch, 565 grains in 1lb. of tubers.

American Blacks. Height of stem, 2½ feet. Strong and upright. Leaves, darkish green, and slightly hoary. Flowers, purplish. Tubers, irregularly round. Skin, dark bluish purple, with a few small white streaks. Increase, 13 fold. Medium, good flavour, very subject to curl. Starch, 546 grains in 1lb. of tubers.

Calico. Height of stem, $2\frac{3}{4}$ feet. Rather upright. Leaves, lightish green. Flowers, pale purple. Tubers, round, or slightly flattened. Skin, rough, light brownish red, with small portions of white near the stalk. Increase, 12 fold. Mealy, medium flavour, healthy. Starch, 410 grains in 1lb. of tubers.

Farmers. Height of stem 3 feet; rather upright; leaves small and compact; flowers, purplish and white; tubers, hollowed at both ends, with large deep eyes; skin, red, and white about the hollowed point, rough; increase, 11 fold; mealy, very good flavour, very healthy; starch, 596 grains in 1lb. of tubers.

Marbled. Height of stem, $2\frac{1}{2}$ feet. Rather upright. Small and compact. Flowers, purplish and white. Tubers, round. Skin, marbled, purplish red and white, smooth. Increase, 10 fold. Rather waxy, indifferent flavour, very subject to curl. Starch, 423 grains in 1lb. of tubers.

Saunderson's Red Rose. Height of stem, $2\frac{3}{4}$ feet. Upright, compact. Leaves, short, wrinkled, reflexed, and hoary. Flower, light reddish purple. Tubers, flattened or hollow towards the stalk. Skin, light brownish red, darkish towards the point, blotched with white. Increase, 13 fold. Mealy, good flavour, healthy. Starch, 706 grains in 1lb of tubers.

Black Seedling. Height of stem, $2\frac{1}{2}$ feet. Upright and compact. Leaves, small and dark green. Flowers, almost white. Tubers, round. Skin, smooth, dark reddish purple. Increase, 10 fold. Rather mealy, goodish flavour, very subject to curl. Starch, 480 grains in 1lb. of tubers.

Flamingo, or Red Early. Height of stem, $2\frac{1}{2}$ feet. Upright, compact. Leaves, small and dark green. Flowers, purplish. Tubers, round. Skin, reddish purple. Increase, 9 fold. Mealy, very good flavour, very subject to curl. Starch, 657 grains in 1lb. of tubers.

Shetland Red. Height of stem, $2\frac{1}{4}$ feet. Upright, compact. Leaves, small and dark green. Flowers, white. Tubers, round. Skin, reddish purple. Increase, 11 fold. Waxy, indifferent flavour, very subject to curl. Starch, 439 grains in 1lb. of tubers.

Irish Seedling. Height of stem, $2\frac{1}{2}$ feet. Spreading. Leaves, compact, rough, reflexed, and light green. Flowers, purple. Tubers, round. Skin, reddish purple. Increase, 10 fold. Mealy, good flavour, very subject to curl. Starch, 648 grains in 1lb. of tubers.

Cork Red. Height of stem, 2 feet. Spreading. Leaves, darkish green. Flowers, seldom. Tubers, flattened, slightly oblong, and pointed. Skin, roughish, and reddish brown. Increase, 15 fold. Mealy, good flavour, healthy. Starch, 534 grains in 1lb. of tubers.

Early Pale Red. Height of stem, 2½ feet. Upright, compact. Leaves, short and reflexed. Flowers, light purple. Tubers, small, round, or slightly oblong. Skin, rough, and pale red. Increase, 15 fold. Very mealy, superior flavour, rather unhealthy, Starch, 534 grains in 1lb. of tubers.

Kilspindie Bloom. Height of stem, 2½ feet. Pretty strong and upright. Leaves, light green, and slightly hoary. Flowers, whitish. Tubers, oval and flattened. Skin, dark bluish purple. Increase, 13 fold. Very mealy, superior flavour, healthy. Starch, 759 grains in 1lb. of tubers.

Dungeon's Early Red. Height of stem, 2 feet. Spreading. Leaves, dark green. Flowers, seldom. Tubers, slightly oblong, flattened. Skin, rough, and deep reddish purple. Increase, 12 fold. Mealy, medium flavour, healthy. Starch, 481 grains in 1lb. of tubers.

Dunlop's Red. Height of stem, 2 feet. Stems upright and slender. Leaves, dark green, roughish, and reflexed. Flowers, light purple. Tubers, round. Skin, dark red. Increase, 12 fold. Mealy, good flavour, a little subject to curl. Starch, 524 grains in 1lb. of tubers.

Dungeon's Black. Height of stem, 2 feet. Slightly spreading. Leaves, long, light green, and roughish. Flowers, whitish. Tubers, slightly oblong. Skin, dark reddish purple. Increase, 13 fold. Mealy, very good flavour, a little subject to curl. Starch, 530 grains in 1lb. of tubers.

Perthshire Red, Tun or Oblong, flat variety. Height of stem, 2 feet. Slightly spreading. Leaves, rather lightish green. Flower, purple. Tubers, slightly oblong, medium size, and flattened. Skin, pretty smooth, red. Increase, 15 fold. Mealy, good flavour, healthy. Starch, 777 grains in 1lb. of tubers.

Perthshire Red, True or Oblong flat variety, Small-eyed variety. Height of stem, $2\frac{1}{4}$ feet. Slightly spreading. Leaves, rather lightish green. Flower, purple. Tubers, small, round, slightly flattened, small eyes. Skin, pretty smooth, red. Increase, 14 fold. Mealy, good flavour, healthy. Starch, 708 grains in 1lb. of tubers.

Perthshire Red, large-eyed variety. Height of stem, $2\frac{1}{2}$ feet. Pretty upright. Leaves, rather lightish green. Flowers, purple. Tubers, large, oblong, with large eyes. Skin, rough, rather netted-like, bright red. Increase, 18 fold. Rather waxy, medium flavour, very healthy. Starch, 693 grains in 1lb. of tubers.

Buff. Height of stem, $2\frac{1}{2}$ feet. Straggling. Leaves, rough, and light green. Flowers, whitish.

Tubers, large and round. Skin, roughish, and light brownish red. Increase, 15 fold. Mealy, superior flavour, very healthy. Starch, 466 grains in 1lb. of tubers.

Biscuit. Height of stem, $2\frac{1}{4}$ feet. Spreading. Leaves, roughish, large, and light green. Flowers, whitish. Tubers, rather small, round. Skin, smooth, and light brownish. Increase, 13 fold. Mealy, good flavour, very healthy. Starch, 474 grains in 1lb. of tubers.

Poor Man's Profit. Height of stem, 2 feet. Rather upright. Leaves, pretty compact. Flowers, light purple. Tubers, round. Skin, dark reddish purple. Increase, 14 fold. Mealy, superior flavour, rather subject to curl. Starch, 477 grains in 1lb. of tubers.

Red Bread-fruit. Height of stem, $2\frac{3}{4}$ feet. Rather upright. Leaves, lightish green. Flowers, light purple and white. Tubers, slightly oblong and flattened. Skin, dull red, roughish towards the point. Increase, 16 fold. Mealy, good flavour, very healthy. Starch, 762 grains in 1lb. of tubers.

Long Red Kidney. Height of stem, 2 feet. Rather upright and compact. Leaves, dark green, short and rough. Flowers, purplish. Tubers, equal in thickness, long and bent. Skin, dark red and rough. Increase, 13 fold. Medium flavour, very healthy. Starch, 594 prains in 1lb. of tubers.

Douglas's Irish Kidney. Height of stem, 2 feet. Spreading. Leaves, light green, long and rough. Flower, light purple. Tubers, long, and thickest towards the point. Skin, dark bluish purple. Increase, 16 fold. Mealy, good flavour, healthy. Starch, 560 grains in 1lb. of tubers.

Millers' Thumb. Height of stem, $2\frac{1}{2}$ feet. Upright, strong, and compact. Leaves, light green, large and rough. Flowers, very light purple. Tubers, curved, and thickish towards the points, rather small. Skin, reddish. Increase, 13 fold. Mealy, superior flavour, medium healthy. Starch, 549 grains in 1lb. of tubers.

Captain Fraser's Seedling. Height of stem, 2 feet. Pretty upright. Leaves, rather large and loose. Flowers, light reddish purple. Tubers, rather straight and equal in thickness. Skin, whitish, with a few reddish streaks about the point. Increase, 11 fold. Mealy, superior flavour, medium healthy. Starch, 474 grains in 1lb. of tubers.

Red-nosed Kidney. Height of stem, $1\frac{1}{2}$ foot. Spreading. Leaves, light green and smoothish. Seldom flowers. Tubers, long, often slightly curved. Skin, whitish, with a reddish point, and about the eyes. Increase, 16 fold. Mealy, good flavour, and healthy. Starch, 441 grains in 1lb. of tubers.

Bedfordshire Kidney. Height of stem, $2\frac{3}{4}$ feet. Rather upright. Leaves, lightish green, rough.

Flowers, light purple. Tubers, long, thick, and straight. Skin, reddish. Increase, 51 fold. Medium, good flavour, and healthy. Starch, 483 grains in 1lb. of tubers.

Falconer's Kidney. Height of stem, $2\frac{1}{2}$ feet. Rather upright. Leaves, lightish green and small. Flower, white. Tubers, much elongated. Skin, whitish, light red towards the point. Increase, 12 fold. Mealy, good flavour, rather unhealthy. Starch, 432 grains in 1lb. of tubers.

Blue Horn Kidney. Height of stem, 2 feet. Upright and compact. Leaves, short, rough, and light green. Flowers, white, Tubers, very small next the stalk, and slightly curved. Skin, very dark bluish purple. Increase, 13 fold. Medium flavour, healthy. Starch, 500 grains in 1lb. of tubers.

Lord Lauderdale's Kidney. Height of stem, $2\frac{3}{4}$ feet. Pretty upright. Leaves, light green, roughish. Flower, purplish. Tubers, very long and straight, with many eyes. Skin, bright red. Increase, 16 fold. Medium, good flavour, healthy. Starch, 486 grains in 1lb. of tubers.

LATE FIELD POTATOES.

St. Helena Potato. Height of stem, $2\frac{1}{2}$ feet. Rather upright and bushy. Leaves, lightish green. Flower, light and reddish purple. Tubers, irregularly roundish. Skin, whitish, often slightly tinged with red, and pretty smooth. Increase, 18 fold. Rather mealy, good flavour, very healthy. Starch. 684 grains in 1lb. of tubers.

Pink-eyed Irish Round. Height of stem, 2¾ feet. Strong and upright. Leaves, large, smooth, and rather narrow. Flowers, purple. Tubers, roundish. Skin, whitish, with pink eyes. Increase, 15 fold. Rather mealy, good flavour, very healthy. Starch, 650 grains in 1lb. of tubers.

Lancashire Pink-eyed. Height of stem, 2½ feet. Strong and upright. Leaves, large, smooth, and rather narrow. Flowers, very light purple. Tubers, roundish. Skin, whitish, with pink eyes. Increase, 14 fold. Rather waxy, indifferent flavour, very healthy. Starch, 661 grains in 1lb. of tubers. Sometimes called the *Redstreak.*

Tartar. Height of stem, 2½ feet. Strong and upright. Leaves, large, and light green. Flowers, very light purple. Tubers, roundish. Skin, whitish, with irregular reddish purple streaks. Increase, 13 fold. Rather waxy, indifferent flavour, rather subject to curl. Starch, 608 grains in 1lb. of tubers.

White-eyed Blue, or Black. Height of stem, 2¾ ft. Pretty upright. Leaves, small, thin, and rough. Flowers, dark purple. Tubers, small and irregularly oblong. Skin, dark bluish purple, with whitish eyes. Increase, 12 fold. Rather waxy, indifferent flavour, healthy. Starch, 523 grains in 1lb. of tubers.

Staffald Hall. Height of stem, $2\frac{1}{4}$ feet. Rather straggling. Leaves, rough, lightish green. Flowers, light purple. Tubers, rather flattened, round, or a little oblong. Skin, dark red, approaching to purple. Increase, 22 fold. Very mealy, very superior flavour, very healthy. Starch, 813 grains in 1lb. of tubers.

Sawyer's Red. Height of stem, $2\frac{1}{2}$ feet. Rather straggling. Leaves, rough, lightish green. Flowers, light purple. Tubers, slightly oblong, flattened, and pointed-like. Skin, dull red, approaching to purple. Increase, 17 fold. Rather waxy, indifferent flavour. Starch, 903 grains in 1lb. of tubers.

Late Jersey. Height of stem, $2\frac{3}{4}$ feet. Upright and compact. Leaves, rough, large, and dark green. Flowers, light purple. Tubers, slightly oblong and flattened. Skin, rough and dark red. Increase, 16 fold. Rather waxy, indifferent flavour, very healthy. Starch, 903 grains in 1lb. of tubers. Sometimes called *Jersey Blues.*

Entire Black. Height of stem, 3 feet. Strong, upright and compact. Leaves, short, dark green, and hoary-like. Flowers, whitish. Tubers, round. Skin, dull, dark purple, roughish. Increase, 15 fold. Medium flavour, very healthy. Starch, 429 grains in 1lb. of tubers.

Scotch Black. Height of stem, 3 feet. Strong, upright and compact. Leaves, short, dark green, and hoary-like. Flowers, very little purple. Tubers, round, and much hollowed at the stalk. Skin, shining, dull leaden colour, very rough, and netted-like. Increase, 16 fold. Medium flavour, very healthy. Starch, 522 grains in 1lb. of tubers.

Esslebach. Height of stem, 2¼ feet. Pretty upright and compact. Leaves, dark green, roughish. Flowers, whitish. Tubers, oblong and flattened, often slightly curved. Skin, roughish, and dull red. Increase, 14 fold. Medium, good flavour, healthy. Starch, 589 grains in 1lb. of tubers.

Orchards. Height of stem, 2 feet. Bushy. Leaves, darkish green. Flowers, light purple. Tubers, roundish, and slightly flattened. Skin, dull red. Increase, 13 fold. Medium flavour, very healthy. Starch, 456 grains in 1lb. of tubers.

London Blues. Height of stem, 2½ feet. Bushy. Leaves, darkish green, and slightly hoary. Flowers, very light purple. Tubers, round. Skin, dark bluish purple and rough. Increase, 16 fold. Mealy, good flavour, very healthy. Starch, 687 grains in 1lb. of tubers.

Welch Field. Height of stem, 2 feet. Rather upright and compact. Leaves, short and rough. Flowers, purplish. Tubers, irregularly round. Skin, dull, pink, and smoothish. Increase, 15 fold. Rather waxy, indifferent flavour, healthy. Starch, 706 grains in 1lb. of tubers.

Robertson's Giant Kidney. Height of stem, 2½ feet. Strong and bushy. Leaves, lightish green. Flowers, white. Tubers, thickish. Skin, purple, rough. Increase, 16 fold. Rather waxy, medium flavour, healthy. Starch, 457 grains in 1lb. of tubers.

Feuille de Haricot. (Kidney-bean-leaved.) Roundish, flattened. Eyes, few and shallow. Brownish rough skin, purplish in places. Flesh, white. Flavour, excellent; is prolific, and keeps well.

LATE, AND ADAPTED FOR CATTLE.

Pink-eyed Dairy-maid. Stem, $2\frac{1}{2}$ feet. Rather bushy. Leaves, light green and rough. Tubers, large, roundish, and deep-eyed. Skin, whitish and purplish. Increase 26 fold. Rather waxy, indifferent flavour, healthy. Starch, 506 grains in 1lb. of tubers.

Irish Lumpers. Height of stem $2\frac{1}{2}$ feet. Pretty upright. Leaves, dark green. Flowers, light purple. Tubers, large, oblong, and much flattened. Skin, whitish. Increase, 23 fold. Waxy, bad flavour, healthy. Starch, 661 grains in 1lb. of tubers.

Cups. Height of stem, $2\frac{1}{4}$ feet. Pretty upright, close. Leaves, darkish green. Flowers, light purple. Tubers, large, oblong, often irregularly shaped. Skin, dull pink. Increase, 20 fold. Mealy, good flavour, very healthy. 687 grains in 1lb. of tubers.

Connaught Cups. Height of stem, $2\frac{3}{4}$ feet. Pretty upright, close. Leaves, large and smoothish. Flowers, purple. Tubers, large, slightly oblong. Skin, dull, reddish pink. Increase, 19 fold. Mealy, good flavour, very healthy. Starch, 630 grains in 1lb. of tubers.

Daly's Wonder. Height of stem, 2½ feet. Strong, upright, and close. Leaves, large, and dark green. Flowers, very light purple. Tubers, large, with large deep eyes. Skin, whitish. Increase, 21 fold. Medium flavour, very healthy, and vigorous. Starch, 560 grains in 1lb. of tubers.

Brown's Fancy. Height of stem, 2½ feet. Rather bushy. Leaves, lightish green, and roughish. Flowers, light purple. Tubers, slightly oblong and flattened. Skin, whitish. Increase 18 fold. Medium flavour, very healthy. Starch, 498 grains in 1lb. of tubers.

Common Yam. Height of stem, 2¾ feet. Strong and rather spreading. Leaves, large and light green. Flowers, whitish. Tubers, large and oblong. Skin, dull, pink. Increase, 18 fold. Waxy, indifferent flavour, very healthy. Starch, 393 grains in 1lb. of tubers. Suited to heavy soils.

Red Yam. Height of stem, 2½ feet. Upright and bushy. Leaves, large, smoothish, and dark green. Flowers, light purple. Tubers, large and oblong. Skin, bright, reddish. Increase, 17 fold. Waxy, indifferent flavour, very healthy. Starch, 440 grains in 1lb. of tubers.

Ox-Noble. Height of stem, 2½ feet. Rather spreading. Leaves roughish. Flowers, whitish. Tubers, slightly oblong and flattened. Skin, whitish. Increase 17 fold. Rather waxy, indifferent flavour, very healthy. Starch, 442 grains in 1lb. of tubers.

Wild Potato. Height of stem, $2\frac{1}{4}$ feet. Compact and bushy. Leaves, very large, smooth, and light green. Flowers, whitish. Tubers, slightly oblong, and tapering to the point. Skin, very light pinkish. Increase, 18 fold. Waxy, bad flavour, very healthy. Starch 492 grains in 1lb of tubers.

Emperor. Height of stem, $2\frac{1}{4}$ feet. Strong and bushy. Leaves, darkish green. Flowers, purple. Tubers, large and roundish. Skin, rough, and reddish purple. Rather mealy, good flavour, but subject to curl. Starch, 457 grains in 1lb. of tubers.

LATE SORTS, CURIOUS RATHER THAN USEFUL.

Red Pine Apple Potato. Height of stem, 2 feet. Bushy. Leaves darkish green. Flowers, purple. Tubers, small, oblong, with numerous deep eyes. Skin, smooth, and deep red. Increase, 10 fold. Waxy, medium flavour, healthy. Starch, 474 grains in 1lb. of tubers.

Long White Apple Potato. Height of stem, $1\frac{1}{2}$ foot. Bushy. Leaves, lightish green. Flowers, purplish. Tubers, small, oblong, with numerous deep eyes. Skin, smooth, and white. Increase, 10 fold. Waxy, medium flavour, healthy. Starch, 367 grains in 1lb of tubers.

Short White Apple Potato. Height of stem, 1½ foot. Bushy. Leaves, lightish green. Flowers, purplish. Tubers small, roundish, with many deep eyes. Skin, smooth and whitish. Increase 8 fold. Waxy, medium flavour, healthy. Starch, 510 grains in 1lb. of tubers.

German Long. Height of stem, 2 feet. Rather upright. Leaves, lightish green. Flowers, almost white. Tubers very long, with many eyes. Skin, smooth and reddish. Increase, 9 fold. Waxy, medium flavour, very healthy. Starch, 486 grains in 1lb. of tubers.

Fairy Potato. Height of stem, 1 foot. Weak and pretty upright. Leaves, very close. Flowers, purple. Tubers, very small and long. Skin, smooth and whitish. Increase, 5 fold. Waxy, medium flavour, rather delicate. Starch, 396 grains in 1lb. of tubers.

Little Nut. Height of stem, 1¼ foot. Weak and pretty upright. Leaves very close. Flowers, light purple. Tubers, small and roundish. Skin, whitish. Increase 9 fold. Rather mealy, goodish flavour, rather delicate. Starch, 580 grains in 1lb. of tubers.

Chesnut. Height of stem, 1½ foot. Bushy. Leaves, darkish green. Flowers, light purple. Tubers, small and roundish. Skin, purple, reddish eyes. Increase, 10 fold. Rather mealy, goodish flavour, rather delicate. Starch, 595 grains in 1lb. of tubers.

Everlasting. Height of stem, 2 feet. Pretty upright, bushy. Leaves, darkish green. Flowers, purplish. Tubers, small, rather oblong. Skin, dull, reddish pink. Increase, 8 fold. Waxy, medium flavour, rather delicate. Starch, 480 grains in 1lb. of tubers.

In addition to the preceding very full and correct information, the following Table also gives some very valuable particulars relative to some of the same and other varieties well known in this country and France.

Form.	Color.	Name.	Set increased itself.	Water.	Starch.	Albumen Fibres.
r	red	Sotte ville	152	81·2	10·95	7·85
r	rose	Rohan	82	79·0	16·08	4·92
r	rose	Rohan (early) ..	66	73·1	10·42	16·48
r	rose	Yellow rose	62	78·4	14·42	7·18
r	yellow	Champions (first quality)	46	73·7	13·33	13·97
r	yellow	Kay's American ..	46	72·5	16·73	10·77
r	white	Noble ox	46	75·1	16·26	8·64
r	yellow	Wellington (first) ..	42	70·9	15·86	13·24
r	yellow	Auxnoble	42	71·5	18·44	10·06
r	yellow	Large early American ..	41	76·5	15·46	8·04
r	rose	Very early white and rose	40	75·5	18·08	6·42
r	rose	Bruges	40	78·7	16·15	5·15
r	yellow	Truffe d'aout.. ..	40	71·5	17·63	10·87
r	yellow	Hopson (first quality) ..	38	70·1	16·52	13·38
r	violet	Algerine ..	34	78·1	17·40	4·50
r	yellow	Early Shaw	32	69·6	17·30	12·90
r	rose	Variable ..	30	77·5	11·43	11·07
r	violet	Paris market.. ..	29	76·9	14·69	8·41
r	red	Lille..	29	76·0	11·15	12·85
l	violet	Choice red	27	79·5	15·94	4·56
r	yellow	Maiiloche	26	75·7	18·17	6·13
r	red	Noble	26	79·6	14·43	5·97
r	yellow	Champions (seconds) ..	25	83·4	10·92	5·78
r	rose	Semi-red	25	78·5	7·12	14·38
r	yellow	Pine apple	22	76·0	13·85	10·15
r	rose	Claire et bonne ..	21	70·4	16·29	13·31
r	yellow	Bread fruit	21	70·0	16·07	13·93
l	yellow	Knights	21	73·4	15·22	11·38
l	violet	Red Paris market ..	21	68·0	13·33	18·67
l	yellow	Dutch	21	74·8	11·92	13·28
r	rose	Descroisille	20	76·0	10·46	13·54
l	red	Late Irish	19	81·3	12·57	6·13

Form.	Color.	Name.	Set increased itself.	Water.	Starch.	Albumen Fibres.
r	yellow	Sanderson	16	70·3	15·10	14·60
l	red	Dutch	14	71·9	13·15	15·75
l	yellow	English ash-leaved ..	14	71·7	12·18	17·12
l	yellow	Common early ..	14	72·5	14·04	13·46
l	yellow	Sigouzae	12	76·8	15·50	9·70
r	rose	Rosy red	11	71·6	13·63	14·77
l	violet	Blue horn	10	82·8	10·70	6·50
r	yellow	Common	10	77·9	12·83	9·27
l	yellow	Chinese	9	73·1	8·24	12·66
l	yellow	Very early	9	72·5	14·04	13·46
r	rose	Roches	8	77·3	12·32	10·38
r	yellow	Early dwarf	6	81·6	8·18	10·22
l	yellow	Toute bonne	6	75·0	11·32	13·68
l	yellow	Jaune d'aout	5	78·5	6·19	15·31
r	rose	Sommelier	5	77·0	6·09	16·91
r	rose	Calcinger	5	78·0	8·45	13·55
r	red	Violette a peau rouge ..	5	79·0	8·69	12·31
l	yellow	Artichoke	3	75·5	7·84	16·69
r	white	Premieres façons ..	3	73·7	14·55	12·75
r	yellow	United States, 6 weeks	2	81·5	8·95	9·55

(*Gard. Chron.* 1841, p. 86.)

MODES OF PROPAGATION.

To obtain new varieties, the potato must be propagated by seed; whilst, to multiply established varieties, resort must be had to their tubers, and either cuttings or layers of their stems.

Seed.—A variety of the potato is generally considered as continuing in possession of its distinguishing qualities and vigour for about fourteen years; after which period its excellencies decrease or altogether cease, and it becomes unproductive, ill-flavoured, and liable to disease. This renders it desirable that new varieties be raised occasionally from seed; and there is no doubt that by cross impregnation the good qualities of any two varieties might be united in their offspring. For example, a mealy but unproductive variety would be a good male from which to impregnate the flowers of another variety less mealy but prolific.

Excellence of quality and prolificacy are most desirable characteristics for a potato to possess; but another, scarcely less so, is early ripeness. It is very desirable to have only such varieties cultivated as have the vital union between the tuber and the stem entirely extinct early in July. They are then safe from any disease impartible to them from the diseased foliage; and let it ever be borne in mind, that early ripeness and long keeping are found to be quite as, if not more, compatible than is long keeping with late ripening. In other words, lateness of growth in the foliage is rather opposed to tardiness of excitement by heat in the tubers; for in tubers from such plants the gummy matter is larger in proportion to the starchy matter than in the early ripening; and excess of gum in a potato is generally indicative of ready excitability.

The following are the best modes which have been recommended for sowing seed and raising seedlings:

Squeeze the ripe potato apples in water, strain all through a cloth, dry the seed before the fire, and keep it in a dry place. In February, if you have the convenience of a hot-bed or hot-house, let it be sown thinly in flower-pots of rich light earth, and cover very lightly. In a month or six weeks, or as soon as the young plants are an inch high, they are to be raised carefully, and planted singly in small pots, and placed in a frame where they will have a very little warmth, and where they must have plenty of air and water as required until the middle of May, when they may be turned out of the pots into the open ground, without breaking the ball. By this treatment the potatoes will be so large the first year as to enable you to judge of their merits. If you cannot command artificial warmth, sow the seed in shallow drills of light rich earth early in April, and transplant the young plants into rich earth in June; raise the potatoes at the usual time, and treat them afterwards in the usual way: they will prove themselves the second year. (*Gard. Chron.* 1844, 806.)

Zander, Count Arnim's gardener, at Boitzenburg (in Mecklenburg), has succeeded in producing a good crop of potatoes from seed the same year as it was sown, and as large as those from sets; and those seedling potatoes are entirely free from disease. His plan is as follows: he gathers the apples before the frost sets in (according to others a slight frost does not injure them), and keeps them in a dry place till the end of January. The apples are then crushed with the hand into a vessel, where they lie from six to eight days to rot, that the seeds may be easily separated from the pulp. Water is then poured on, and the seed is washed and dried like cucumber seed, and put away in a dry place. At the end of March, or beginning of April, the seed is sown in a hot-bed, and treated much the same as other culinary plants. If there is a convenient place for a hot-bed near a wall or house, exposed to the sun, glass is not necessary; the plants may be treated like tuberous plants, but as they are very susceptible of frost at night, they should be covered with straw or boards, which can easily be done, as the bed is surrounded with boards set in the ground, upon which the covering can be laid without injuring the plants. In May, if the plants are well grown, they can be planted out in a light soil about the usual distance that sets are planted. Zander, in 1845, sowed early potato seed on the 11th of April, and planted them out on the 26th of May; and here we may remark, that vegetation is 14 days later in Boitzenburgh than in Berlin. The plants produced from 1 to 1½ gallons (metre) of tubers. One plant even produced 280 tubers. There were of course a great many small tubers among them, yet the produce of large ones was, on the whole, equal to the produce from sets. As Zander has followed this plan for five years, he is now able to give seed to several gentlemen's gardeners and labourers. The potatoes used by them all proved healthy, while the disease was everywhere, and even in the neighbourhood. The space of half a square rood of land (7 feet) is sufficient to raise enough to plant one acre. (*Preussische Zeitung, Oct.* 1845.)

Another mode is the following:

When the "potato apple or plum" is ripe, preserve it from frost till it is shrivelled, when the pulp, &c. may be mixed with peat-mould, and preserved in that way till sowing time. About this season a slight hot-bed may be made, and when filled to about one foot from the glass a layer of turf should be placed above the fermenting material, with the grassy side down, and over this about four inches in depth of peat-mould and rotten dung, or fine rich mould, should be spread; then sow the seed in rows, four inches apart, adding a little soil between them as the plants advance. As the plants grow they should be freely exposed in fine weather, and gently watered; and when they have advanced to about six inches in height, in the beginning of May, or when all danger of frost is over, they may be planted out into rows of a suitable distance apart, placing the plants pretty thickly in the rows. Nothing more is now needed but to attend to them in the usual way. In a small bed, of three or four feet across, some thousands of plants may be raised. (*Gard Chron.* 1845, 260.)

The following is Mr. Macartney's method of obtaining new kinds of potatoes from seed :—Sow the seed in a hot-bed, about the middle of February, in lines six inches apart, a quarter of an inch deep, and very thin. When water is necessary, sprinkle it between the lines, but avoid wetting the plants, as that would injure them. A little air must be given before they are watered.

" As the plants rise, rich earth, carefully put between the lines, will add fresh vigour to them ; but the tops of the plants must not be covered by these mouldings, which should be occasionally repeated, until they are fit for transplanting. To prepare them for this, about the end of April they must be plentifully refreshed with air ; and, two hours before removing them, they must be plentifully watered all over, and the glasses covered with bass mats, to prevent the sun, if shining at the time, from scorching the plants. Take each plant up carefully, with a ball of earth attached to it, and plant them in trenches, as you would celery, only with this difference, the distance from plant to plant in the lines must be 18 inches ; and if the sun should be shining out strong at the time of planting, a flower-pot should be placed over each to prevent flagging ; for, with all your care in taking up, a good many of the fibres will be broken. After the plants have established themselves, remove the pots, and earth up occasionally, as long as the space between them will admit of it. The produce of new kinds of potatoes raised in this manner is generally prodigious for twelve years afterwards. The best manure is yellow moss and rotten horse-dung. (*Gard. Mag.* vi. 440.)

It is to be remarked, that the tubers of every seedling should be kept separate, as scarcely two will be of a similar habit and quality, whilst many will be comparatively worthless, and but few of particular excellence. If the seed is obtained from a red potato that flowered in the neighbourhood of a white-tubered variety, the seedlings, in all probability, will in part resemble both of their parents; but seldom or never does a seedling resemble exactly the original stock. At all events, only such should be preserved as are recommended by their superior earliness, size, flavour, or fertility.

The early varieties—if planted on little heaps of earth, with a stake in the middle, and when the plants are about four inches high, being secured to the stakes with shreds and nails, and the earth washed away from the bases of the stems by means of a strong current of water, so that the fibrous roots only enter the soil—will blossom and perfect seed.

Sets.—The set has far greater influence over the future crop than is usually admitted. It is quite true that the mere sprouts from a tuber, or an eye scooped from it, or even a piece of its paring, will occasionally, and under favourable circumstances, produce good crops; but, on the other hand, long experience, and the dictates of science and common sense, demonstrate to me that moderate-sized whole tubers, on an average of years, will produce the greatest crops. Whole tubers are much less liable to failure, either from the occurrence of wet, unseasonable weather, or the assaults of worms and slugs; and if an ungenial spring occurs, there is no doubt that a good sized set imparts sustenance to the early forming tubers, which the slow advance of the foliage prevents this from supplying them with.

I am quite sure that, in the great majority of years, this power causes the potato crop to be forwarder and more abundant just in proportion to the size of the set. The largest potatoes will, on an average of seasons, produce the largest return; and it is only a want of knowledge from experiments, that the excess of crop is more than compensatory for the want of economy in the sets, that withholds me from recommending their employment.*

* Mr. Knight observes, that it has been contended that there is much waste in the practice of planting large sets; because the old tuber is often found to have lost little in weight, when an early crop is taken up in an immature state; and it has thence been inferred that a very small part only of the matter of the old tubers enters into the composition of the new. But I believe a false inference has in this case been drawn, and that,

For the main crops, it is evident from experiment that moderate sized whole potatoes, weighing about 2ozs., are better than cut sets.

For the early crops almost the very contrary to the above is the most advantageous to be practised. The set should have the crown-eye, which is one growing in the centre of the congery of small ones, preserved. Some potatoes have two such eyes, but the generality only one. This is always the most prompt to vegetate, and if not known by this description, may be evinced by placing two or three potatoes in a pan of moist earth near the fire. If the earth is kept moist, the crown-eye will be in a state of vegetation in five or six days.

To obtain early crops, where tubers are rapidly formed, large sets should be employed. In these, one or two eyes at most are allowed to remain. If the sets are placed with their leading buds upwards, few and very strong early stems will be produced; but, if the position is reversed, many weak and later shoots will arise, and not only the earliness but the quality of the produce be depreciated. For the ear-

under ordinary circumstances, a very large portion of the soluble matter of the old tubers is employed in the formation of the new; for I have proved by experiments purposely made, that the vital union, and community of circulating fluid, between the old tuber and the plant which has sprung from it, is not so soon dissolved. (*Knight's Papers*, 257.)

liest crops there are likewise several modes of assisting the forward vegetation of the sets. These are prepared by removing every eye but one or two; and being placed in a layer in a warm room, where air and light can be freely admitted, with a covering of straw, they soon emit shoots, which are strengthened by exposure to the air and light as much as possible, by taking off the cover without injuring them, and thus the leaves soon become green and tolerably hardy. In early spring these sprouted sets are planted out, the leaves being left just above the surface, and a covering of litter afforded every night until the danger of frost is passed. The only modification of this plan adopted in Cheshire, where they are celebrated for the early production of potatoes, is, that they employ chaff or sand for covering instead of straw. (*Johnson's Mod. Gard. Dict.* 514.)

As I plant whole potatoes, so do I leave their eyes untouched; because I find, after long practice (though I once thought otherwise), that a tuber never produces more stems than it can nourish effectually, and that the more numerous the stems, if the planting has been at the properly wide distances, the more abundant the produce. Some persons have thought that numerous stems occasion an irregularity in the size of the tubers; but this is not so, for every tuber partakes of the sap elaborated in each of the stems.

In case of a deficiency of moderate-sized potatoes, then sets of a similar weight, cut from a large tuber, and having one or two robust eyes, are to be preferred before small whole potatoes for planting. The reason for this will soon be apparent if some of each be planted; for the cut sets will produce strong, vigourous stems, elaborating an abundance of sap, and consequently yielding an abundant crop; whereas the small potatoes will have a small weak herbage, and the produce of tubers be small both in size and aggregate quantity.

Quite equal in importance to the size of the set is the time at which it should be taken up for planting; and I cannot too emphatically urge that this should not be done until the ground is actually dug for its reception. Take up, and plant again immediately, should be an axiom never to be departed from by the potato-grower. If cut sets be employed, this is additionally imperative; and if there ever was an ignorant, senseless practice, it is that adopted by some farmers of cutting the sets for some days before they are required, and leaving them either to dry and shrivel, or, if in a heap, to ferment and heat, and in either case to have their vegetative powers diminished. Dusting the sets with lime does not mend the matter, for this can only check the exhaustion, which would not occur at all if the sets were inserted promptly. If a set has sprouted, never rub off these incipient stems, for these always are the strongest, and will become the most productive plants. If removed, though others will be produced, yet each succeeding sprout is invariably weaker than its predecessor. If cut sets are employed, and an early produce is desirable, it may be useful to know that those furthest from the point by which the tuber is attached to the stem are always the first to vegetate. Sets cut from the middle of the tubers are the next in earliness, and those nearest the stem end the most tardy in sprouting. Earliness of produce is promoted by placing the sets with the eyes upwards; and largeness of size in the sets promotes the same object as well as increases the produce. These effects, as observed by Mr. Knight, obviously spring from the large accumulation of sap in them. Fed by means of this, not only a large breadth of foliage is produced more early, but this contains much disposable organisable matter, which once formed a part of the parent tuber. Any person who will pay attention to the growth of early crops of potatoes, which have sprung from large tubers, will readily obtain evidence of the truth of this position. The variation in the comparative growth of fruits of different species in similar seasons frequently arises from the more or less perfect state of the reservoir formed in the preceding year; and every experienced gardener knows that, under any given external circumstances the blossom of his fruit trees sets best when the preceding year has been warm and bright, and when his trees, in such season, have not expended their sap in supporting heavy crops of fruit.

Not only are the top-eyes, or those furthest from the stem connection, the most early in producing a crop, but also the most prolific. This is consonant with my own experience, that the earlier the crop of a given variety is matured, the greater is the produce, all other circumstances of culture being similar. Mr. Goodiff, of Granard, in Ireland, has published the results of his experiments upon this point, and they shew that top eyes are more prolific than bottom eyes in the proportion of about 24 to 14.

When it is necessary to obtain potatoes from a distance for planting, it is most desirable that they should come from a colder district than that to which they are imported. I never have obtained good crops from potatoes sent to me from Devonshire or Cornwall.

Table of the number of sets of potatoes and total weight of the same, required for planting an acre at the following distances; each set containing only a single eye, and weighing 2ozs.; the distance between the sets in the rows being nine inches:

	Number of sets per acre.	Weight of sets per acre.	
		cwt.	lbs.
Rows 18 inches apart	38.720	43	0
19	36.682	40	104
20	34.848	38	97
21	33.188	37	4
22	31.680	35	40
23	30.302	33	88
24	29.040	32	44
25	27.874	31	12
26	26.806	29	100
27	25.813	28	88
28	24.891	27	84
29	24.033	26	92
30	23.232	25	104

Single Eyes.—Although middle-sized whole potatoes are most certainly to be preferred for sets, yet it is possible that in times of extreme scarcity, and for the rapid increase of some rare varieties, it may be desirable to obtain the greatest possible number of sets from each tuber. In such cases single eyes may be employed; and the following, suggested by Dr. Lindley, seems to be the most judicious mode of preparing them:

Let every potato, before it is boiled, be deprived of its eyes by a scoop, or some instrument which will cut them out with a piece of the potato adhering to it. Let such pieces be rolled in wood-ashes, or be slightly dusted with lime, and laid on a shelf for a day or two, in order to become dry. When thus prepared, they may be packed in a parcel or box in layers of peat pressed close down, and kept in as cold a place as can be found, so that the box is not frozen. In this manner a large quantity of sets will imperceptibly accumulate during winter, and be ready for planting in the spring. They will not be so good as larger sets, but they will, with good management, be a substitute of value. (*Gard. Chron.* 1845. 799.)

"Last year, about the middle of March," says Mr. E. Denison, M.P. of Ossington, Nottinghamshire, "my gardener was planting early potatoes, the ash-leaved kidney. It occurred to him, as an experiment, to cut out some of the best eyes from a certain number of potatoes, and to plant these in rows side by side against whole potatoes. The eyes were cut out with a common knife, and planted at once as they were cut out. The piece was cut out in the shape of a one-inch sided triangle. The sets from these single eyes brought in every case the best crops. From three roots there were one peck of potatoes. One potato weighed $1\frac{1}{2}$lb. The tubers were generally large, weighing nearly $\frac{3}{4}$lb. each. The plants rose with one single stem from the ground, which was strong and vigorous. They were not so early by a fortnight as those from the whole potatoes. This may perhaps be accounted for by the circumstance that in many cases the eyes of the whole potatoes had made strong shoots when they were planted; but eyes which had not sprouted were chosen for cutting out, as being better suited for the operation. Another experiment of the same kind was tried with second-early potatoes, called American natives, with exactly the same results. I have at this moment a crop of early potatoes under frames, grown from a single eye, which look most promising. The advantages which this plan holds out seem to be these:— 1st. In a time of scarcity several eyes may be cut from a single potato, and almost the whole potato is still available for food. 2nd. If sets have to be sent from a distance, as from this country to Ireland, the bulk, and consequently the expense, would be materially diminished. 3rd. In a little time, by attention, by inducing parties to cut the crown off each potato now in the course of daily use, an immense supply of seed might be procured, almost without expense. For the last three months I have had the crown, about the size of a walnut, cut off every sound potato consumed about this place. I have saved in this way a very large supply of seed for the spring. The eyes in these small pieces, cut off as long ago as three months, look quite fresh and well, and are pushing like those in the whole potatoes." (*Proc. Roy. Ag. Soc. of Eng.* Feb. 1846.)

Mr. C. Talmage, of Hersepth, Oxfordshire, gives these directions:

"Plough in a good coat of manure, then plant with bean-dibber a single eye, scooped out, six inches apart and ten inches between the rows. The scoop-bowl should measure one inch in diameter, set on, inclining backwards, and one inch from the handle. A woman can scoop two bushels in a day. The produce I have realised from the above mode has been 226 three-bushel sacks to the acre, heaped measure. In addition to this, more than two-thirds of the potatoes remained for food for my pigs and cows. The experiment I made was as follows: I planted four lands in one field:

The 1st	with	two quarters of a potato	
„ 2nd	„	one quarter	„
„ 3rd	„	two eyes	„
„ 4th	„	one eye	„

The fourth produced just double the quantity of the first." (*Gard. Chron.* 1846. 134.)

Cuttings of the stalks, five or six inches in length, or rooted suckers, will be productive if planted, during showery weather, in May or June; and during this last month, or early in July, the potato may be propagated by *layers*, which are formed by pegging down the young stalks when about twelve inches long, they being covered three inches thick with the soil at a joint.

It was by layering that some Norfolk peasant obtained what he was pleased to term four crops a year of the potato.

SOIL AND SITUATION.

No inhabitant of the garden varies more in quality, in different gardens, than the potato; for a variety will have a strong unpleasant flavour in one soil, that has a sweet agreeable one in another. In a heavy wet soil, or in a rank black loam, though the crop is often fine and abundant, it is scarcely ever palatable. Siliceous soils, even approaching to gravel, though in these last the tubers are usually corroded or scabby, are always to be planted in preference to the above. A dry, friable, fresh, and moderately rich soil, is unquestionably the best for every variety of the potato; and for the earliest crop it may be with advantage more siliceous than for the main ones.

Any variety grown in a heavy wet soil becomes *waxy*, that is, it has an undue proportion of its gummy and watery constituents. In light soils, on the contrary, the potato always forms more starch, rendering it what is termed *mealy*.

It is a common observation, that potatoes delight in a fresh soil—a soil that has long been lying fallow. This is, however, not more true of the potato than of any other cultivated crop. Each and all grow vigorously in a soil thus stored with decomposing matters, and, in the case of the potato, if the soil be excessively fertile, the haulm too often becomes exuberant at the expense of the tubers.

It is usual to consider the potato an exhausting crop, but this opinion, like most other unexamined assumptions, I believe to be a vulgar error. Chemistry demonstrates that a turnip crop, universally allowed to be a non-exhausting crop, takes from the soil quite as much of its earthy and saline constituents as a crop of potatoes, and I have never been able to observe that either brocoli, or other garden crops after potatoes, were less luxuriant than other similar crops by their side, growing where peas had preceded them.

In strong confirmation of my own observations I find, that in the account of Stinchcombe Farm, in Gloucestershire, in Part IV. of the "Royal Agricultural Society's Journal," it is stated that potatoes have been taken as a crop every third year for the last forty years; and the writer, Mr. Morton, says—"I have been in the habit of riding over the farm ten or twelve times a-year for the last 25 years, and I can safely say, that instead of a diminution in the crops, there has been an increase, not only in the yearly return of each of the three crops grown, but also in the quality and fertility of the soil." The writer of this can point to two instances, the one a patch of about an acre, in which potatoes are the only crop which have been grown for many years, and last year the crop was extremely luxuriant; the other, a few acres in the possession of a tradesman, which have been cropt for many years back with potatoes and barley in succession, the one-half of the land being every year in potatoes, and always good crops: in both cases the soil has been well manured.

MANURES.

If I were asked which manure is best for the potato, I should reply the richest stable dung. If, which is next best? *Farm-yard dung*. If, which is third best? Any kind of dung-mixed litter—for I have long since learned that the ingenuity of man will never educe a manure more excellent than that from Nature's laboratory of fertilizers—the dung-hill. Do not let me be mistaken as expressing an opinion, that no other manures can be applied to the potato beneficially. I am very far from thinking so, and consider that many other manures may be used most beneficially for it—but let the potato-grower look to his mixen as long as it will last.

Soot, common salt, and *Epsom salt,* mixed together, form a most excellent compost for the potato, in these proportions per acre:—soot, 30 bushels; salt, 6 bushels; Epsom salt, 3 bushels.

Nitrate of soda, I have found more injurious than beneficial; increasing the verdure of the foliage, yet diminishing the produce of tubers, but used as a top dressing in May, 200lbs. per acre, the following results have been obtained by a very trustworthy man, the gardener of Mr. Fleming, of Barochan:—The soil throughout was manured with stable dung, and where this alone was used, the produce was 66 bolls per acre; with the addition of *nitrate of soda,* 80 bolls; *sulphate of soda* (same quantity) 73 bolls; *sulphate* and *nitrate of soda,* mixed (100lbs. of each) 124 bolls. *(Quart. Journ. Agric.)* A boll is 4 bushels.

Muriate of lime, applied as a spring top-dressing, 1lb. per square rod, gave an increase of one-third of potatoes over the grounds not treated with it.

Refuse of potatoes, such as decayed tubers, the haulm, peelings, &c., mixed with a little stable dung to promote their decay, and moistened with gas ammoniacal liquor, at the time of digging in this compost, forms one of the best fertilizers for the potato. It contains all the matters necessary for their nutriment.

Guano, &c. Guano is too highly stimulating, if placed undiluted in contact with the potato sets. Three cwt. per acre thoroughly mixed with two tons of coal ashes, and a handful dropped into the holes made by the dibble, after the set has been inserted, is an excellent mode of applying this valuable manure.

In a pamphlet, recently published by Messrs. Gibbs and Co., we have much useful information relative to the application of guano to this crop. Mr. Robert Bell, of Gunsbro', near Listowel, states, that this substance, drilled in at the rate of $2\frac{1}{2}$ cwt. per acre, produced an extraordinary heavy crop, the most abundant, indeed, ever seen in that part of Ireland; he also found nitrate of soda very efficient, but guano was the best. A farmer, however, writing anonymously in the *Galloway Register*, asserts, that guano, with him, was inferior to farm-yard dung on light land; the produce of the latter being 12 tons 8 cwt., while guano produced only 10 tons on the same quantity of land, although he used 6 cwt. an acre; but then his potatoes obtained with dung, cost him 14*s.* 2*d.* a ton, while those from guano were most profitable. In these results, however, there is nothing like the precision that is found in some capital experiments, recorded by Professor Johnston, in the last number of his valuable suggestions for experiments in agriculture. For the details of the experiments we must refer to the pamphlet itself, which should be, and from its cheapness may be, in the hands of every farmer and master gardener in the kingdom. They were conducted by Mr. Fleming, of Barochan, and are models for imitation. In a light loamy soil, with a hard subsoil retentive of water, the following produce was obtained :—

Low Field, Barochan. — Description of Top Dressings.	Quantity of Dressing applied per imperial acre.	Produce in pecks of 35 pounds each.	Produce in bolls of 5 cwt. each, per imperial acre.	Produce in tons, &c., per imperial acre.			Cost of Dressing per imperial acre, including carriage and putting on.		
	Cwt.	Pecks	Bolls	Tons.	Cwts.	Qrs.	£	*s.*	*d.*
Sulph. of Magnesia Nitrate of Soda..	1 1	180	90	22	10	0	1	9	0
Sulphate of Soda Sulph. of Ammonia	$1\frac{1}{4}$ $\frac{3}{4}$	151	$75\frac{1}{2}$	18	17	2	1	4	9
Nitrate of Potash	$1\frac{1}{2}$	148	74	18	10	0	2	3	0
Sulphate of Soda Nitrate of Soda..	$1\frac{1}{4}$ $\frac{3}{4}$	144	72	18	0	0	1	4	9
Nitrate of Soda..	$1\frac{1}{2}$	128	64	16	0	0	1	11	0
Sulph. of Ammonia	$1\frac{1}{2}$	116	58	14	10	0	1	11	0
Sulph. of Magnesia	$1\frac{1}{2}$	106	53	13	5	0	0	12	6
Sulphate of Soda	2	98	49	12	15	0	0	15	0
Nothing but Dung	40 cub. yds.	98	49	12	15	0	0	0	0

In this case, an amount of produce, very unusual under any circumstances, was obtained by mixing together two salts, neither of which was remarkable for its effects when employed separately, and, according to the Table, at the cost of 29*s.* only, in addition to the ordinary dressing of manure.

The farm-yard manure was spread at the bottom of the drills when the potatoes were planted

(April 18th), and the saline matters were added afterwards (June 1st), as a top-dressing. The sort employed was the early American, and the distance between the rows was 26 inches. It is hard to say, in this case, what the action could have been: we cannot well refer it to the sulphate of magnesia, although that agent has been strongly recommended by Liebig, combined with cloacine; for when used by itself it produced, in the experiment now recorded, only 13 tons and a quarter; and in another case, mentioned by Mr. Fleming, not quite 11½ tons were obtained from it. Nor does it appear clear for what reason sulphate of magnesia should be so useful; for, according to Sprengel, magnesia, in good mealy potatoes, analysed by him, did not exist to the amount of more than 0,104 in 100·000 parts of the fixed matter, nor did this earth exceed 0·488, in a case where potato parings were analysed. Neither is the mystery in any way explained by a curious case, mentioned by Professor Johnston in another place, where produce, at the rate of 30 tons an acre, was gathered from a small plot of ground, top dressed, "with a mixture of ⅓ nitrate of soda, and ⅔ sulphate of soda." The fact, however, is most interesting and important, whatever the explanation of it may prove to be. In another experiment by the same gentleman, guano, used at the rate of 3 cwt. an acre, brought a crop of 18½ tons, merely when put in with the sets, and not subsequently top-dressed, no other manure being used, and the whole cost, therefore, being about 36*s.* an acre. In a second case, under the same circumstances as the last, when a different sort of potato was employed, and when the soil unmanured brought only $6\frac{3}{4}$ tons, 4 cwt. of guano, worth 48*s.*, produced rather more than $14\frac{1}{4}$ tons; 4 cwt. of guano, with 25 bushels of ashes, $15\frac{3}{4}$; and the same quantity of guano, with 20 bushels of charcoal, $17\frac{1}{2}$ tons; on the other hand, bone-dust, at the rate of 45 tons an acre, only yielded $9\frac{3}{4}$ tons of produce.

What the subsequent effect of these circumstances on the land may be, is an important point to determine, but cannot be at present stated. This valuable fact seems, however, to have come out, namely, that sets taken in 1842, from potatoes treated with the nitrate and sulphate of soda in 1841, produced a better crop than sets obtained from the same variety, which had not been so dressed, to the extent of $3\frac{3}{4}$ tons per acre. "In so far, therefore," says Professor Johnston, "as this experiment is to be relied on—for we must not be hasty in drawing general conclusions—it appears, that the benefit to be derived from a skilful treatment of the potato plant, does not terminate with the greater immediate crop we reap, but extends also into future years, improving the seed, and rendering its after-culture more productive. This idea is worth pursuing, were it only for the purpose of making out the possible existence of so important a physiological law—how much more when it appears so pregnant with important practical results. But thus it is in all cases, that the prosecution of experimental research, with immediate reference either to purely scientific, or to purely practical results, ends in improving and benefitting both abstract science and economical practice. (*Gard. Chron.* 1843, 227.)

Gypsum could hardly be expected to be of benefit to the potato, not being one of its constituents. That it is not of use to them is demonstrated by the following experiments, tried by a practical man at Cookridge, near Leeds, and which, at the same time, give us some valuable information connected with the culture of this crop:—

One row of each, of 140 yards (rows 22 inches apart.)

	st.	lbs.
Common cut sets (say a potato cut into two or three, according to size), planted in 1½ bushel of gypsum	18	8
Ditto, ditto, planted in 9 cwt. of good stable-yard manure	58	11
Ditto, ditto, planted in 9lbs. of guano, with ½ peck of charcoal . . .	46	0
Small potatoes, set whole, planted in 1½ bushel of gypsum . . .	21	11

	st.	lbs.
Small potatoes, set whole, planted in 9 cwt. of stable-yard manure . . .	54	9
Ditto, ditto, planted in 9 cwt. of stable-yard manure, mixed with 1 bushel of gypsum .	56	0
Small potatoes, with all the eyes except one taken out, but not otherwise cut, planted in $1\frac{1}{2}$ bushel of gypsum . .	18	2
Ditto, ditto, planted in 9 cwt. of stable-yard manure	51	5
Common cut sets, dropped into gypsum as cut, planted in 9 cwt. of stable-yard manure	60	0
Ditto, ditto, planted in 9 cwt. of stable-yard manure, mixed with 1 bushel of gypsum .	59	12

The soil light and sandy, on a gravelly bottom; and the gypsum used was calcined.

The potatoes were American natives, planted from the 10th to the 15th of May, and were lifted in the early part of November. The three rows where gypsum only was used in planting, had twice a top-dressing with gypsum after showers of rain; those which came up last were always bad in colour, and stunted in growth.

The guano row came up first, grew the most, was best in colour, and appeared to be growing until November. There was so much top in this row, and the colour so distinct, that it might be perceived as far distant as the field could well be seen; and my impression is, that the weight of root would have been much greater if 8 inches more room had been given to the width of the row, it having been literally choked up with top. Of gypsum, I used at the rate of about 3 tons per acre, costing 5*l.*, which gave in weight of crop at about the rate of 7 tons per acre, costing 14s. 3d. per ton.

Of guano and charcoal about 4½ cwt. Of the former, at 16s., and about 7 bushels of the latter, at 3s., equal 4*l.* 13s., gave 16 tons, at 5s. 6d. per ton. Of stable-yard manure, about 25 tons, at 8s. 10d., gave 20 tons, at 10s. per ton. And where to the latter, about 2 bushels of gypsum were used to cut the sets into, at an extra cost of, say 3s. 6d., the weight of the crop was about 21 tons per acre, costing 9s. 6d. per ton.

The stable-yard manure was, of course, much more expensive to get on the land than the guano, for which I have made no extra estimate above.

These experiments, therefore, give an immense advantage in favour of guano; but whether the succeeding crop (oats) will be equal to the stable-yard manured part remains to be seen, and is an important part of the question. (*Ibid.* 1843, 286.)

Artificial Composts. It is barely possible to believe that any one conversant with the culture of plants, whether practically or theoretically, could ever be so stultish, unsupported as he must be either by facts or just reasoning, as to conclude that poor or exhausted soils could be made to grow remunerative crops merely by adding some mineral saline matters to the earth. However, we hear of such persons, and I may therefore just observe, that all such opinions and expectations are totally unsubstantial. The salts of ammonia may aid materially the productiveness of a soil deficient in decomposing matters, but other saline bodies can only do so in a very trifling degree. Therefore, when the dunghill fails, and composts are required, they should have among their constituents organic decomposing matter, such as decayed tan or saw-dust, as well as salts. Upon this point the observations of Dr. Lindley are correct and valuable. He says, "experiments show that plants are but little improved by simple substances when they can get nothing else; and that it is only when the soil in which they grow has been manured, and still retains a quantity of the organic matter so introduced, that the effects of simple substances become advantageous. This is to some extent exemplified in the experiments by Mr. Fleming, of Barochan, on a soil which, without being recently manured, produced $6\frac{3}{4}$ tons of the red don potato. Fifty bushels of wood-ashes (which may be regarded as a simple manure) raised the crop only three-quarters of a ton, at the expense of 25s.; but 4 cwt. of natural guano, a very compound substance, added more than $7\frac{1}{2}$ tons, at the total cost of 48s. (reckoning guano at its present price). But when 25 bushels of wood-ashes were added to 4 cwt. of guano, the crop rose about $1\frac{1}{2}$ ton further, at the additional cost of 12s. 6d. So that, where wood-ashes were used alone, the small quantity of potatoes obtained by them cost 33s. 4d. a ton; while, in combination with guano, the same substance furnished potatoes at the expense of only about 8s. a ton.

"This strikes us as an important fact, and one upon which it would be well to experiment further in the present season. But it is rendered still more remarkable by another experiment.

"To the guano and wood-ashes, 20 bushels of charcoal were added, at a cost of 7s. 6d., and the effect was to add $1\frac{3}{4}$ tons more to the crop; so that now the additional crop cost scarcely more than 4s. a ton. This may be stated a little differently in the following manner:

"Where wood-ashes (a simple manure) were used, the potatoes obtained beyond what the land would yield without any manure whatever, cost £1 13s. 4d. per ton. But where wood-ashes were used in addition to more complicated manures, the crop was enlarged at an expense in manure amounting only to from 6s. 3d. to 6s. 8d. per ton of extra produce,

"These things seem to prove conclusively that the best way of using saline or simple manures for the potato crop is to apply them in addition to common manures, and not on any account to trust to them by themselves. Probably influenced by a conviction that the true way of preparing artificial manures is to compound them of many different substances, Mr. Fleming was led to try two other experiments, with the view of determining how far economical mixtures may be made to supersede farm-yard dung in the growth of potatoes. The first was as follows:

No.	Ingredients.	Quantity intended to manure four acres.			Cost of substances for four acres.		
		cwt.	qrs.	lbs.	£	s.	d.
1	Rape dust . . .	5	0	0	1	10	0
2	Bones dissolved in muriatic acid .	2	0	0	0	12	0
3	Sulph. of magnesia	0	2	24	0	6	0
4	Carbonate of lime	2	0	0	0	1	6
5	Nitrate of soda .	0	2	0	0	10	0
6	Common salt . .	1	2	0	0	2	3
7	Sulphate of soda .	1	2	0	0	9	0
8	Sulph. of ammonia	0	2	0	0	10	0
9	Sulphur. . . .	0	0	2	0	1	0
10	Dry moss-earth .	6	2	0			
		20	0	26	4	1	9

" Remarks.—The above mixture was sown in the drills at the rate of 5 cwt. per imperial acre, at a cost of little more than £1 sterling, and produced a fair crop of potatoes of a remarkably fine quality: 43

bolls per acre of imperial Renfrewshire measure, weighing 5 cwt. each, upon a poor and light, although new soil, but not worth more than 25s. per acre. Great caution is required in using this mixture, as it is very apt to burn the cut sets if laid directly upon them. A little earth should be put between the cut potato and the manure. In this instance the crop was $10\frac{3}{4}$ tons an acre, and the cost of the manure was rather less than 2s. a ton of produce.

"The other case was the following:

No.	Ingredients.	Quantity mixed to manure one acre.			Cost of substance for one acre.		
		ct.	qrs.	bush	£	s.	d.
1	Saw-dust, mostly from alder	..		40			
2	Potash and lime mixed, 14 months old . .	..		10	0	7	6
3	Common salt . . .	1	2	..	0	2	3
4	Sulphate of ammonia .	1	0	..	1	0	0
5	Sulphate of soda . .	0	2	..	0	3	6
6	Sulphate of magnesia .	0	2	..	0	4	0
7	Coal tar, 20 gallons, say	..		..	0	10	0
		3	2	50	2	7	3

"Remarks.—The potatoes planted with the above mixture came quickly through the ground, and were very luxuriant in foliage. They were lifted 15th October, after being cut down by frost while still unripe and growing. On being taken up, they were found to yield a produce of 56 bolls of Renfrewshire measure, weighing 5 cwt. each per acre, of very fine potatoes, many of which weighed from 24ozs. to 30ozs. each.

" N.B. This mixture, after being put together, fermented, and was frequently turned, but kept dry. Here the crop was 14 tons an acre, at the expense of 25s. 11d. a ton. All this seems strongly in favour of mixture manures, and especially of that which is naturally compounded. It seems, too, to shew that the best way of using simple saline substances is not alone, but as an aid to those in common use."—(*Ibid.* 1843. 243.)

Top-dressing. When manure at the time of planting happens to be deficient, it is a most excellent plan to sow in April, when the plants are well above the surface, guano, at the rate of 3 cwt. per acre, well mixed with the same quantity of dry coal-ashes to make it friable, and consequently easily delivered broadcast. Immediately after applying it, hoe the surface thoroughly for the sake of burying the manure a little beneath the surface, to preserve it from the heat of the sun, which drives off its ammoniacal constituents.

The following experiments with top-dressings were tried, in 1843, by Mr. W. Smyth, Mitchelstown, Kells. He says,

" The land is of very superior quality, consisting of a moderately tenacious clay, through which a considerable portion of an impure carbonate of lime is interspersed; part of which is incorporated with the soil, and part occurs in the form of small stones, which, however, are rarely of such a size as to form an obstacle to the operations of tillage. It had been previously many years in grass, and being merely marked out into ridges by the common plough, the potatoes were planted on the surface without any manure. This practice is well known throughout a great part of Ireland. It is also usual to let the land in this state, to produce a crop of potatoes, to the neighbouring cottagers, and from £4 to £6 per acre is frequently obtained for this purpose. This is the con-acre system, which has at different periods attracted public attention, as one of the causes of the pauperism in that country. The potatoes were planted on the 15th of April, and were of the variety called 'cups.' The ridges were five feet wide, five sets being placed across the ridges, being thus nearly a foot distant across, and nearly eighteen inches distant in the other direction. These were covered about three inches deep with the earth out of the furrows. Before the young shoots had reached the surface through their covering, the various manures were spread on the surface in the proportions stated below. An additional covering of earth, two inches deep, was then put over the ridges. The application of the manures and the covering of earth took place the same day, on the 20th of May. On the 15th of June the spaces between the rows across the ridge were loosened by the hoe, and drawn up to the stems of the plants, forming, in fact, drills, as it were, across the ridges. The potatoes were taken up 10th October, and the following table exhibits the results :

Kind of Manure.	Quantity applied per acre.	Produce per acre.		Cost of application.		
		tns.	cwt.	£	s.	d.
1. Guano	3 cwt.	19	11	2	2	0
2. Bone-dust	18 bush.	15	13	2	5	0
3. Nitrate of soda . . .	2 cwt.	16	19	1	16	8
4. Nitrate of potash . .	2 cwt.	15	5	2	14	0
5. Muriate of ammonia .	2 cwt.	17	15	2	15	6
6. Salt and quick-lime in equal quantities . .	8 cwt.	14	17	0	12	0
7. Farm-yard manure .	10 tons	16	3			
8. No manure applied .	..	13	10			

" The farm-yard manure was that of the preceding season, which had remained over in the yard, and was therefore well decomposed. Each of the other manures was mixed with a small portion of dried earth a few days before being applied. The common salt was obtained from a provision store, and contained a considerable portion of animal matter, as blood and pieces of fat, though its effects in combination with the lime were not very great. The whole of the manures applied were successful, in so far as having considerably overpaid the original outlay. (*Ibid.* 1844. 236.)

Mr. J. Campbell, of Templemoyle farm, Londonderry, has published the following as results of his experiments :

Manures.	Quantity applied per Cunningham acre.	Cost of manure per Cunningham acre. £ s. d.	Produce in tons, &c. per Cunningham acre. tons. cwt. qrs. lbs.	Value of produce at $2\frac{1}{2}$d. per stone. £ s. d.	Increase in tons, &c. above no top-dressing. tons. cwt. qrs. lbs.	Increase in value above no top-dressing £ s. d.
Farm-yard dung alone . . .	30 tons	4 10 0	7 10 0 0	12 10 0		
Farm-yd.dung & Soot	30 tons 40 bush.	5 6 8	10 7 0 16	17 5 3	2 17 0 16	4 15 3
Farm-yd.dung & Common guano.	30 tons 3 cwt.	6 0 0	11 7 3 12	18 19 9	3 17 3 12	6 9 9
Farm-yd.dung & Potter's guano .	30 tons $2\frac{1}{2}$ cwt.	6 7 6	9 7 0 16	15 11 11	1 17 0 16	3 1 11

"The potatoes were planted the 7th May, with the farm-yard manure, in the usual manner, and the guanos and soot applied as a top-dressing before the first moulding in June. (*Londonderry Sentinel*, April, 1845.)

Coal Tar.—A paper was read to the Bath Agricultural Society, in 1844, in which the writer states that he had used this manure for seven years, applying by a water-cart 180 gallons per acre. It cost him a halfpenny per gallon, and was applied two or three months before the soil had to be broken up. He found it highly beneficial for turnips, carrots, and potatoes.

Common Salt.—The following is an extract from the 13th edition of Mr. Cuthbert Johnson's excellent little pamphlet, entitled "*Observations on the Employment of Salt*:"

"Apply from 10 to 20 bushels of salt to the surface as soon as the potatoes are planted, or 10 bushels in the previous autumn, and 10 after inserting the set. My experiments with salt to potatoes were upon a light gravelly soil. The result was as follows:

	Produce in Bushels per Acre.
1. Soil without any manure	120
2. Soil manured with 20 bushels of salt, the previous September	192
3. Soil manured with stable dung at the time of planting	219
4, Soil manured with stable dung and 20 bushels of salt	234
5. Soil manured with 40 bushels of salt alone, 20 in September and 20 in the spring, after the sets were planted	192½
6. Soil manured with 40 bushels of salt as in the last experiment, and also with stable dung	244

"These experiments are entirely confirmed by those of the Rev. E. Cartwright, of Tonbridge. From a copious table, which the farmer will find at page 82 of my Essay on salt, I extract the following statement:

	Produce in Bushels per Acre.
1. Soil without any manure	157
2. Soil manured with 9 bushels of salt per acre	198
3. Soil manured with 8 bushels of salt and 30 bushels of soot per acre	240
4. Soil manured with 30 bushels of soot per acre	182

"'Of ten different manures,' concludes Mr. Cartwright, 'most of which are known and of acknowledged efficacy, salt, with one exception, is superior to them all.'"

TIMES FOR PLANTING.

THAT early autumn is the best time for planting, I consider now to be placed beyond all doubt. By early autumn, I mean September and October, but late autumn planting, in November, is preferable to winter planting in December and January, and these months even are to be prefered to spring planting. Under any circumstances — whatever may be the season at which the planting is effected—allow the crops of all varieties to remain undisturbed until they are required for planting, and then, *the earlier the better*, take up so many as will afford a sufficient number of middling-sized tubers for planting for next year's crop. By middling-sized, I mean such as weigh from 2 ozs. to 3 ozs. each. Keep these out of the ground not an hour longer than is unavoidable.* I recommend the crop to be taken up no faster than the ground is ready for immediately planting the middling-sized tubers. Dig just enough ground for one row, and then plant with a dibble, without treading on the newly.dug soil, that it may lie as loosely as possible over the sets ; for its being well permeated by the air is an additional security against the penetration of frost—air being one of the worst conductors of heat, and consequently the best excluder of cold, which is no more than an abstraction of heat. Plant six inches deep, twelve inches apart in the rows, and the rows eighteen inches apart. No frost, however severe, will injure them at that depth, if the soil is

* A writer in the *Gardener's Chronicle* for 1842, very strongly urges, that to preserve potatoes best, "they ought not to be exposed to the light a single day after they are dug up. The less they are dried the better, for drying injures the skin." He is quite right, and only stopped just one step from observing, that the best mode of avoiding such injury is to leave them in the ground until wanted. The first person who publicly advocated autumn-planting, I think, was Mr. James Tindall, gardener to J. Errington, Esq., of Beaufort House, Durham. He says, he adopted the practice in 1820, and published his recommendation of its adoption in the *Trans. of the Hort. Soc. of Durham, &c.*, in 1828.

not clayey or wet. If it be either clayey or wet, then drop in a handful of coal-ashes over each set. The autumn-planted crop will appear later above ground than the spring-planted. Keep the plants well hoed, but do not earth them up. The haulm, both foliage and stem, will be quite dead early in August. This year (1846) it was completely dead and dry by the 14th, in crops of Julys and red-nosed kidneys planted in October.

The potatoes necessarily taken up when getting those required for seed, store away in the coldest place at command, and in earth or coal-ashes. But if the space be not required for other crops, let the potatoes remain in the ground where grown, to be taken up as required. The only precaution required is to clear away the weeds and refuse, and with a hoe to draw up the earth, so as to form a ridge three or four inches additionally deep over each row. As required, a fortnight's consumption may be taken up at a time during any open weather in winter.

Leaving the potatoes until required for seed undisturbed in the soil wherein they were grown, is not broached by me as a new practice, but as a salutary one, too little heeded; and to its efficacy I offer the following additional testimony:—It has been practised for some years on a few farms south of Perthshire, "with the desired effect of preserving, unimpaired, their vegetative properties. The same practice is adopted by the natives of New Zealand." (*Gard. Chron.*, 1844, p. 251.) And Mr. Girdwood, of Bute, says, "I have known the plan of keeping those intended for seed in the ground all the winter, *having tried it for several years past with uniform success.*" (*Ibid.* p. 596.) Mr. Burnet, of Gadgarth, says, "he invariably found potatoes left in the ground come up vigorously without any failure at all." (*Ibid.*) Mr. Allison, of Mearns, says, "that if whole potatoes be used for two or three years, and the crop be left in the ground, the disease will become extinct." Sir Robert Bateson, Mr. Goodiffe, Mr. M'cI, and Mr. Fleming, bear similar testimony, from experiments tried in Ireland.

The following are additional testimonies in favour of autumn-planting:—

A physician, at Eastbourne, in Sussex, states, that in November, 1844, he planted three gallons of a sort called Noblowers; the sets were inserted whole, one foot deep, in long stable manure, and in rows 2½ feet apart: they came up later than others of the same sort planted in the spring following, and yielded three bushels, taken up the first week in September, and perfectly undiseased. The haulm had decayed previously to the appearance of the murrain in the neighbourhood. (*Ibid.* 1845, p. 609.) Mr. J. A. Dorant, of Sopwell Nursery, near St. Albans, met with similar success with the early frame and ash-leaved kidney. The produce was good, and free from disease; and he observes, "Nothing can be more strengthening to the opinion, that autumn-planting with whole sets generally succeeds the best. (*Ibid.* p. 641.)

Mr. Grey, of Dilston, one of the best practical and most enlightened farmers of the present day, has long practised autumn-planting; and from his repeated and accurate experience, states that it yields, on the average, one-third more than spring-planting. In 1844-5, he made further experiments on a large scale, and thus narrates the result:—"In October last I prepared my land, and planted my potatoes in drill rows of 30 inches width, applying fold manure below the sets, but leaving three rows unplanted for each intermediate month between October and April inclusive. Three rows were similarly dunged and planted in November, three at the end of December, three early in March, and the remainder in April. January and February were too severe to permit planting. To produce 10 stone weight of potatoes there required to be taken up—

Of the October-planted	. . . .	30	yards
,, November ,,	. . . .	32	,,
,, December ,,	. . . .	32	,,
,, March ,,	. . . .	44	,,
,, April ,,	. . . .	45	,,

This demonstrates "that a loss of power is sustained by allowing the seed to remain in pits till the spring." (*Ibid.* p. 719.) Mr. Grey adds, that autumn-planting was adopted, not suggested, by himself, for it was long before practised by other farmers in Cumberland, in Glendale, and on the Tweed.

Mr. Trotter, of Stockton, has tried autumn-planting on strong clay land, and finds it succeed, although spring-planting on the same soil signally failed. (*Ibid.* 1844, p. 811.)

Mr. Barnes, head-gardener at Bicton Gardens, Devon, in a letter to me, dated August, 1846, says, "It will be proved in time that the race of potatoes is no more worn out than is the human race. We have no tubers affected with the disease where soot and charred refuse were used as manure, but the stalks and foliage are attacked by the insects. We have had astonishing crops of potatoes this season from the autumn-planted, and what we have left in store keep very well in charred matters. Our seed tubers, too, at present are sound and good, having no appearance of disease; but then they have been well dressed with soot and charred sawdust, with a small portion of slacked lime added, and well greened, of course. I am quite satisfied with them at present. *Though our autumn-planted crops are so abundant, we have none worth digging or taking up from those planted in spring.*"

W. P. Taunton, Esq., of Ashley, near Stockbridge, Hants, bears similar testimony in a letter with which he has favoured me, dated the 29th of August, 1846. He says, that for the last three or four years he has practised autumn-planting his potatoes, growing annually about two acres. He also says, "for economizing time and labour, I have for the most part planted when and as I took up the old crop. I have about twenty sorts in cultivation, but at present my researches are confined to Fox's Early Delight, from Scotland; and Charlies, a Gloucestershire variety. Both of these prove good eating kinds, and very few, if any, diseased roots among them. I may add, that the earliest ripe are generally the safest from the disease, which ought to turn our attention to the culture of early (ripening) varieties. My neighbours, both farmers and cottagers, who planted at the usual spring time, have been severely mulcted, anknowledging their potatoes generally to be very bad." (*Johnson's Potato Murrain and its Remedy.*)

From the foregoing and many other proofs, some of which will be quoted when considering the "Diseases" of the potato, it must be evident to any impartial mind, that early autumn is the best time for planting it, securing as it does a crop one-third more abundant than if the planting be defered until the spring. Even in this latter season the lapse of a month we see, from the experiments of Mr. Grey, makes a great reduction in the produce, and this is quite confirmed by experiments carried on in the garden of the London Horticultural Society, where, as Dr. Lindley has recorded, a crop planted the first week in March exceeded that planted in the first week of April by about one ton and a quarter per acre. There is no ground for the fear that the sets of autumn-planted potatoes are liable to be destroyed by severe frosts in winter. No such contingency ever happens, or can happen, if the sets are buried six or seven inches beneath the soil's surface.

It will be seen from the following table, kept by Mr. Sharp, manager at the Winchester Gas Works, that during the severe winter of 1845, and at the coldest of its periods, the temperature of the soil at a depth of six inches only just descended to the freezing point, and at 12 inches never. But if it were otherwise, and the sets of the potatoes were actually frozen, still they would be totally uninjured, for all experience shews that freezing a potato does not injure it, provided the subsequent thawing is gradual, as it is at six or seven inches below the surface. Every one must have had this fact brought to his notice by plants appearing in the spring from potatoes that have been left in the ground accidentally where they were grown the year previously, and this even in the severer climate of Scotland.*

* It is stated in the *Gardener's Chronicle* for 1845, p. 241, that potatoes were planted only five inches in October, and

Month.—1845.	Therm. in shade. Lowest.	Therm. in shade. Highest.	Therm. in soil. 6 in.	Therm. in soil. 12 in.
Jan. 1	35 degs.	44 degs.	39 degs.	39 degs.
.. .. 15	38	46	40	41
Feb. 1	24	38	33	35
.. .. 15	29	41	31.5	34
Mar. 1	33	47	35	36
.. .. 15	20	37	31.5	32.5
April 1	33	56	41	42
.. .. 15	39	48	43	43
May 1	48	64	51	51
.. .. 15	43	62	48	49.5
June 1	48	68	53	55
.. .. 15	58	80	65	63
July 2	50	67	57	57.5
.. .. 15	45	68	55	57
Aug. 1	49	65	55	56
.. .. 16	41	62	54	56
Sept. 1	56	64	58	59
.. .. 16	49	54	52	55
Oct. 1	45	62	50	52
.. .. 12	35	57	47	49
Nov. 4	26	49	41	45
.. .. 16	50	55	45	46
Dec. 1	33	52	—	—
.. .. 15	45	55	—	—
1846.				
Jan. 3	25	42	34	38
.. .. 26	47	53	47	47
Feb. 8	35	49	40	41
.. .. 18	39	49	40	41
Mar. 1	45	56	—	—
.. .. 21	21	48	37	40
April 1	41	59	—	—
.. .. 15	48	62	—	—
May 8	46	68	58	54
.. .. 27	39	73	60	54
June 1	50	79	—	—
.. .. 15	52	84	67	66

that the frost in the winter penetrated eight inches, being purposely tried; yet the sets were quite uninjured. Mr. Shepherd, a great cultivator of the potato in the Isle of Man, says, in the winter of 1839 the frost continued so late that there was a scarcity of potatoes for his own table; so that he had to use a pick-axe to open the ridges; yet immersion in *cold* water for two hours before cooking was all that was necessary, and neither they nor the sets in the ground were injured.

In recommending *early* autumn-planting, it appears that I must except Cornwall, or at least the most southern portions of it; for Mr. Mitchinson, gardener to E. W. Pendarves, Esq., of Pendarves House, has stated that he plants on a warm border about the end of September, and that the plants attain a sufficient growth before the autumnal frosts set in to produce young potatoes for table by the end of December. Previously to the frosts occurring long litter is covered over the plants to exclude the frost from their roots. (*Gard. Mag.* ii. 174.) In other parts of England, to obtain potatoes late in the autumn, they must not be planted after July. Mr. Fulton, gardener to Lord Northwick, in Worcestershire, says he always plants in that month; that the produce is ready for table in November; that they keep very well through the winter in the ground, some oak-leaves being spread over the surface: and that it is the best mode of obtaining what may be called an early winter crop. (*Ibid.* iii. 406.)

MODE OF PLANTING.

The most preferable mode of inserting the sets is with the dibble, in rows; for the early crops 18 inches apart each way, and for the main ones 18 or 24 inches, the wider interval being for the taller stemmed varieties. The sets should be placed six inches beneath the surface. The potato-dibble is the best instrument that can be employed; the earth being raked or struck in with the dibble, and the soil not trampled upon, but planted as sufficient is dug for receiving a row. This applies especially to the autumn-planted; for the looser the soil less does frost penetrate, and the more readily does superfluous moisture escape. The compartment may be laid out level and undivided if the soil is light; but if heavy soil is necessarily employed, it is best disposed in beds (usually called *lazybeds*) six or eight feet wide. If the staple of the soil be good throughout, the alleys may be two feet wide and dug deep, otherwise they must be made broader, and only one spit taken out, the earth removed being employed to raise the beds, which should not be more than four parallel ridges, and the sets inserted along their summits. (*Johnson's Dict. Mod. Gard.* 514.)

If the potatoes be planted by the dibble, the stable manure is best spread upon the surface at the time, and dug in previously to inserting the sets. When drills are made in recently dug ground, in which to plant the sets, it is usual to put the manure in the drills, and place the sets upon it, but many practical men say that it is far better to place the sets first in the drills and then to scatter the manure over them. I deprecate the plan altogether, for the ground must be consolidated by trampling, and there is abundant reason against having the roots induced to crowd closely together about the sets, which they always do when the best pasturage is there to be found. Still more objectionable is the slovenly system of *digging in* potatoes—that is, planting the sets along the trench made by the spade in digging, and covering them with the next spadeful. It is open to the last objection mentioned to planting in drills, and the irregularity of depth and distance at which the sets are liable to be placed is also materially injurious.

There are some gardeners who plant their potatoes at one uniform distance, whatever may be their stature, yet the absurdity of this practice needs no demonstration, until some one can be found to maintain that the gooseberry and the apple may be best planted at the same distances apart. The dwarf-growing varieties of the potato should be at intervals of 18 inches each way; whilst the tallest growths should be at two feet. The following experiment, made by Professor Lindley, seems decisive. Early champions, of which the stems average two feet in length, were planted in rows, 30 inches, 24 inches, 18 inches, and 6 inches apart; the produce per acre respectively was as follows:—

	Tons.	cwt.	lbs.
30 inches produced ..	15	19	82
24	24	0	0
18	22	16	102
6	16	17	110

The same excellent authority concludes, and it is in accordance with my own experience, long since published, that six inches is the best *depth* at which to plant the sets on average soil. Dr. Lindley founds his opinion on an experiment in which those planted—

3 inches deep, gave per acre	..	13 Tons
4	..	14 „
6	..	14½ „
9	..	13 „

In field-culture of the potato the best mode of planting is to plough the earth into ridges, thus ; to place the sets in the drills thus formed, and then cover the sets by splitting or cleaving down the ridges with the plough, and thus forming other ridges over the sets. In the early spring these ridges may be harrowed down, and subsequently the hoe should keep the surface loose and free from weeds.

CULTURE DURING GROWTH.

The potato cultivator may always keep in remembrance that the surface, to the depth of two inches, cannot be too frequently stirred by the hoe between the rows, so long as it can be done without injuring the leaves.

As soon as the plants are well to be distinguished they should be perfectly freed from weeds; and of the early crops the earth drawn round each plant, so as to form a cup as a shelter from the cold winds, which are their chief enemy at that season. But the main crops should not be earthed up, for earthing up diminishes the crop one fourth. Throughout their growth they should be kept perfectly clear from weeds. It is very injurious to mow off the tops of the plants, as is sometimes recommended. The foliage ought to be kept as uniform as possible, unless, as sometimes occurs on fresh ground, the plants are of gigantic luxuriance, and even then the stems should be only moderately shortened. It is, however, of considerable advantage to remove the fruit-stalks and immature flowers as soon as they appear, unless the stems are very luxuriant; for, as Dr. Lindley observes, the flowers and fruit are formed at the expense of the sap elaborated by the leaves: if of those secretions a part is consumed in the organization of flowers and fruit, there is so much the less to accumulate in the tubers; but if no such consumption is permitted, the tubers become the depositories of all the nutritious matter the plant produces.

There is some discretion requisite as to the time when the blossoms should be removed; for it should be so done as not to give the plants an opportunity of throwing out fresh flowers, which will exhaust the tubers. The best time is just before the formation of seed-vessels. If the flowers are taken off too soon the plants may exert themselves to propagate their species before the tubers are strong enough to consume the extra nourishment provided by the destruction of the blossoms. (*Gard. Chron.* 1844. 851.)

To protect from frost the foliage of the earliest crops in spring, it is an effectual plan to stick the twigs of fir loppings, or of beech, retaining their leaves, over the rows every evening, removing them again in the morning, until the danger of night frosts is past. It is to be observed, however, that if the stems of early potatoes are cut down by the frost, they will be renewed. The crop is retarded a little, but not destroyed.

The editor of the *Irish Farmer's Journal* relates, in his paper of Oct. 21, 1825, an experiment made in his own garden at Rathfarnham, near Dublin, to ascertain the effect of artificial watering on the potato. Though the water was not given in sufficient quantities, and apparently was poured on the drill instead of in the furrow between the drills, still the result was in favour of watering.

In the south of France and in Italy, about Avignon and Florence, for example, the potato is grown in the fields in rows, and as soon as they are earthed up the water is admitted, twice a week, ten or twelve hours each time, in the furrows between the rows, so that the soil and subsoil is as thoroughly soaked as in watering grass lands. In the Vale of the Arno every description of crop is grown in drills, and watered in this manner; and although the practice of watering arable land does not suit the cold and moist climate of the British Isles, yet, when it is tried, the process observed in countries where it is carried on successfully on a large scale, should be imitated.

A correspondent of the Dublin editor judiciously recommends making holes with sticks among the roots of the plants, at least a foot deep, and pouring the water into them. In India the potato is irrigated like all the other crops.

I have long had doubts relative to earthing-up potatoes being a beneficial practice, and now I am convinced that it is detrimental. The variety employed in my experiments is the pink-kidney; all the sets were planted in the first week of April, in rows 2 feet apart and 18 inches in the rows, and taken up at the end of September, and weighed.

The average of my experiments gives exactly an increase of one-fourth in favour of not earthing-up; but some of the plots gave still more, viz., as 42 lbs. is to $31\frac{1}{2}$ lbs. The experiment has been made on the sixteenth of an acre of good deep loam, with a cool, moist subsoil. In the unearthed-up rows, the diseased potatoes were more numerous, in the proportion of 22 to 9; though of very rare occurrence anywhere. The tubers of the unearthed-up were nearest the surface, and the disease was almost entirely confined to those at the very top. The earthed-up rows died off the earliest, though rather the strongest, and they did not leave so many greened tubers, from exposure to the light, as were in the rows unearthed-up.

TIME AND MODE OF TAKING UP THE CROP.

SOME have recommended that potatoes intended for seed stock should be taken up a fortnight or three weeks before being fully ripe, in the belief that by doing so, it would prevent the curl in the future crop; but this is an error, I think, which, if adopted, will have a tendency rather to increase than diminish the evil; and on no account would I recommend such a practice to be followed, believing that it is to this and similar injudicious methods of treatment that many of the failures in the potato crop may be frequently ascribed. In my opinion it is essential to the keeping of potatoes in a proper manner, whether for seed or for store, to have the roots perfectly matured before they are taken out of the ground. It is not enough that the stems and leaves have begun to decay; sufficient time should be allowed after these may have withered for the roots to ripen, until it is found that the skin has acquired such a degree of firmness as not to come off on being gently rubbed, which it invariably does when they are immature. (*Gard. Chron.*, 1841, 660.)

So far from its being judicious to take up the tubers before the stems are quite faded, there can be no doubt left upon the minds of those who have duly investigated and tested by experiment the antagonist modes, that the potato should be left where grown as long as the ground is not required, and that upon no account should any be taken up either for seed or storing, until the stems are totally dead. The best mode is to take up every second row only, and then to shovel the earth from the space thus made over the rows left untouched, until the potatoes are buried ten or twelve inches deep. The earth requires to be thus deep over them, because, even if not ridged by earthing-up, yet it is more solid, and therefore parts with its heat more readily than soil newly-dug. The potatoes from the rows taken up will be best kept by placing them in layers alternately with earth, so as not to touch each other, on the north side of a wall, covering the whole about twelve inches deep also with earth, and with a smoothed inclined surface outside to shoot off the rain. No implement ought to be employed for taking up the roots but a fork, with three flat prongs, and the mode most economical of time and labour, and, consequently of expense, is to sort the potatoes at the time of taking them up.

PRODUCE.

THE largest crop per acre obtained by Mr. Knight, the late president of the Horticultural Society, was 34 tons 9 cwts., from an early variety, manured with oak leaves, which is nearly the extreme amount he thought possible to be grown, and half that amount is usually considered a good crop by ordinary cultivators. "Forty-fold" is the name applied to one variety, because it was justly considered by its sponsor that such a return is the characteristic of an extremely prolific potato, but occasionally a vastly greater return has been obtained. Thus, Mr. W. Thomson states, that he planted whole a single tuber, which had been sent to him as a very prolific variety. It weighed 6 ozs., and upon taking up the produce in the autumn, it weighed 29 lbs., and consisted of 66 potatoes, of which 26 weighed 21 lbs. (*Gard. Chron.* 1843, 774.) This was more than 77 fold.

The largest single potatoes of which I have read was one of the Blucher red variety, weighing 2lbs. 3ozs., and was grown in the garden of Mr. A. Donald, miner, of Lownie, parish of Dunnichen, N.B. The others are stated by Mr. Saul to have been grown by Mr. Worthington, a farmer, at Hiskin, and to have weighed 4½lbs. and 5lbs. each. (*Ibid.* 1844. 804.)

STORING

I HAVE stated in the proceding section my own views of the best mode of preserving the tubers viz., allowing them to remain where grown but well covered with earth. When taken up to make room for other crops, or to store for present use, I have also stated the best mode of preserving them to be in alternate layers with earth on the north side of a wall. This mode is recommended by reason as well as practice, for the injury from which the thoroughly ripened tuber has to be guarded is germination, not decay. A ripe tuber is not liable to premature putrefaction, therefore moisture being present is of no consequence; but to preserve it fit for table use it must be kept from vegetating, and this is delayed just in proportion to the lowness of temperature in which it is retained. It would remain for years without sprouting if kept at, or below, 35 deg. Instead of earth, turf ashes or other burnt refuse may be employed as a packing stuff in storing potatoes, as is particularly recommended by Mr. Barnes, of Bicton Gardens, and other excellent practitioners.

I have said that moisture being present is of no consequence; nor is it, if the packing material be earth or ashes; but it is very much the contrary where the potatoes are placed in heaps in contact with each other, and still more so if intermingled with straw. In either case, but especially the latter, fermentation is powerfully induced, much heat is consequently evolved, and the sprouting of some tubers, andthe decay of more, is the speedy consequence.

If a pit is employed for storing, though I warn my readers that it is far less efficient than layering with earth, let the pit be kept as cold as possible, constructed with a northern exposure, and never let straw be brought in contact with the potatoes. The following structure on the north side of a wall is good of its kind :—Excavate to the depth of 5 feet, and width of about 8 feet; with, round the interior, a dry wall, carried 2 or 3 feet above the level of the surrounding ground; let the roof be 18 inches in thickness of thatch and stubble; outside the wall, and up to the eaves, place earth laid firm in a sloping manner; and the entrance be by a door at one end.

The following facts offer much suggestive matter to the potato storer:

In the severe winter of 1814 the potato pits of the cotters and other labourers were for a protracted period frost-bound and inaccessible, so that on the accession of mild weather there was a general move to get in a portion of the hoarded roots. It was found on this occasion that in a number of the pits the potatoes were frosted; and, strange to say, these were in general found in those lots most deeply and carefully covered with soil! The frost storm had lasted so long, and been so severe, as to penetrate even the most thickly earthed pit. The thaw came with a very moist S.W. wind, and of course penetrated most readily into the shallowest pits. The thaw in these had been completely yet gradually effected, while in the others more thickly coated the frost was not displaced, when the potatoes contained in them were exposed suddenly to the influence of a very mild wind. The plan recommended of keeping seed potatoes undisturbed in the soil wherein they have grown, is practised on a few farms in this vicinity (S.E. of Perthshire) with the desired effect of preserving unimpaired their vegetative properties. The same thing is practised by the natives of New Zealand, with this difference, that the seed is left in the soil when grown to grow again another crop. This plan, of course, will not suit the farmers of Britain, but may sometimes be witnessed in gardens where a last year's potato sprouts up, is allowed to stand, grows with great vigour, and generally furnishes an enormous crop. Where potatoes are allowed to remain in possession of the soil which grew them, it is advisable to take up every other row or drill, and earth up the residue more deeply. This is the mode of procedure in the instances noticed, and the crop is almost as secure as if pitted or housed; in many cases more so, for there is no risk of dry rot. If farmers suitably circumstanced were to carry the above recommendation into effect, an adequate supply of seed potatoes might be furnished for the market, and the hazard of failure cease to annoy us.

Mr. Baker, of Writtle, recommends houses to be formed for storing potatoes, in the following manner. He says that houses with sides of unburnt earth, either in mass or moulded, and afterwards put together, were better than those of any other description, being non-conductors of heat, and preserving an even temperature. The mode he recommended was to mix clay (chalk clay) by treading with horses, and adding straw or hay. This was then conveyed to a mould, made similar to a brick mould, being 18 inches long, 12 inches wide, and 6, 8, or 9 inches deep. The mould he used was 6 inches in depths The mould, being placed upon a level grass-field, should be filled with the mixed clay, and rammed in, the sides being previously wetted. It might then be lifted up, and the clay lump left exposed to the drying of the sun and air ; whilst others would be made in succession. In a few days they should be raised on the edge, and kept turned over until dry, which would occupy a few weeks, according to circumstances. Houses could be made with these lumps at little expense, that would entirely protect potatoes or any other root crops from frost. Mr. Baker's method was to excavate the foundations, and fill with common concrete (if in a dry situation), two or more feet. Upon this an inferior brick should be worked, to the height of 18 inches, as a foundation. Then the lumps should be covered up in the same manner as brick-work, uniting them with broken clay, or any coarse mortar made with four or five bushels of sand to one of lime. The lumps cost 5s. to 6s. per 100, according to the thickness, each containing the quantity of from 12 to 18 bricks. A house 40 feet long and 14 feet wide might be carried up for £6, and if thatched fully answers the purpose, and better than even brick-work, through which the frost will sometimes penetrate; and by covering the external surface of the walls with coal-tar occasionally the clay would become hardened to such a degree as to render it unsusceptible of the effects of wet or frost, and in point of durability equal to stone or composition walls.—(*Gard. Chron.* 1844. 760.)

Greening—that is, exposing potatoes to the light and weather until they have attained a greeen colour—has been recommended as a mode of rendering them less excitable, and consequently less forward in vegetating. This may be so, but if potatoes are stored in the way I have recommended, or are planted immediately they are taken up, there is no necessity for this unnatural treatment. By greening in this mode a chemical change is caused in the tuber; solanin is produced, and the parenchyma, or seat of colour, in the tuber undergoes the same change as is effected in a blanched leaf by exposing it to the light and air.

Upon this point, Dr. Lindley has observed, the stems, and in fact all the parts of the potato-plant above ground are more or less poisonous. Tubers are occasionally formed along the stem, but they are, as we all know, green and bad. This is entirely owing to their exposure to light; for had the stems been laid in the earth, so as to have covered such stem-tubers from the commencement of their growth, they would have been just as good as the tubers of the usual underground formation. On the contrary, tubers naturally produced from a part of the stem below the surface, although they may be of various colours outwardly, are blanched internally, unless they grow themselves out of the soil. In that case they acquire a green tinge throughout, and with it a quality bad, like that of the spurious tubers in full daylight on the stem above the ground. It is, fortunately, not much the practice now, but formerly in towns, and in London particularly, large heaps of washed potatoes were to be seen exposed for sale and to the action of light, and in some situations, occasionally, to the direct rays of the sun.

Potatoes, even in their dirty state, as taken up, will be considerably altered in colour, both externally and internally, and proportionably impaired in quality, by a few day's exposure to light in clear weather, although they may not be exposed to the sun's direct rays; but the effect must be much greater when the surface is washed and deprived of the partial shade afforded by the particles of soil. On the part of the vendors, it may be argued that exposure is necessary for sale; but this argument would soon fall to the ground were purchasers aware that, all other circumstances being the same, potatoes which have suffered the least possible exposure are the best for food, aud *vice versa*. The time was when potatoes were in many instances spread out in the sun, in order to dry them before storing in the earth. No practice could be worse, for the reasons above stated; and, moreover, the object in view, that of rendering them ultimately drier and better in quality, was not attained.

On the contrary, although deprived of a portion of their moisture in the first instance, yet this only left room for the absorption of moisture contaminated with gases generated in the cave. Such gas will be generated in greater quantity if straw, or other vegetable substances, apt to decay, are employed as a covering next the potatoes.

Fine white-fleshed kidney potatoes have been known to be tinged yellow throughout in consequence of having been covered with straw. The straw was no doubt dry when used, but it soon acquired damp, and the conditions of decay from the layer of earth resting upon it. Potatoes so tainted are said to taste of straw, or, in other words, to possess that well-known musty flavour which decayed straw communicates.

The bad quality imparted being so easily traced to this material, it is surprising that straw should continue to be so much employed in contact with potatoes. Some persons may perhaps grant that the least possible exposure to light should take place between taking up and storing, and yet many consider it necessary that potatoes taken up in a very wet state should be dried previously to being stored, in order to avoid a greater evil than that resulting from exposure, namely, their rotting. It has, however, been found, that although potatoes were taken up and immediately stored in the earth, in moderate quantities, with the mud so wet as to be dripping through the baskets, yet those potatoes presented as dry an appearance when uncovered in spring as those that were stored in a dry condition. In the former case it may be presumed that part of the excess of moisture would descend to the bottom of the pit and then draw off; moreover, that when the covering of earth became colder than the potatoes and the water on their surfaces, the latter would be gradually condensed on the particles of the surrounding soil, the process continuing so long as the tubers maintained a higher degree of temperature. (*Gardener's Chronicle*, 1844, 651.)

FORCING.

THE season for forcing is from the close of December to the middle of February, in a hotbed, and at the close of this last month on a warm border, with the temporary shelter of a frame. The hotbed is only required to produce a moderate heat. The earth should be six inches deep, and the sets planted in rows six or eight inches apart, as the tubers are not required to be large. The temperature ought never to sink below 65 deg., nor rise above 80 deg.

The rank steam arising from fermenting dung is undoubtedly injurious to the roots of potatoes; and to obviate this they may be planted in narrow beds, and the dung applied in trenches on each side; or all the earth from an old cucumber or other hotbed being removed, and an inch in depth of fresh being added, put on the sets, and cover them with 4 inches of mould. At the end of five days the sides of the old dung may be cut away in an inward slanting direction, about fifteen inches from the perpendicular, and strong linings of hot dung applied.

If the tubers are desired to be brought to maturity as speedily as possible, instead of being planted in the earth of the bed, each set should be placed in a pot about six inches in diameter; but the produce in pots is smaller. However, young potatoes may be obtained in the winter, according to the following plan, without forcing:—Plant some late kinds, unsprouted, in a dry rich border, in July, and again in August, in rows two feet apart. They will produce new potatoes in October, and in succession until April, if covered with leaves or straw to exclude frost. If old potatoes are placed in dry earth, in a shed, during August, they will emit young tubers in December.

Preparation of Sets for forcing.—They should be of the early varieties. To assist their forward vegetation, plant a single potato in each of the pots intended for forcing, during January. Then place in the ground, and protect with litter from the frost. This renders them very excitable by heat; and, consequently, when plunged in a hotbed, they vegetate rapidly and generate tubers. The seed potatoes are equally assisted, and with less trouble, if placed in a cellar just in contact with each other, and as soon as the germs are four inches long, are removed to the hotbed.

Management.—More than one stem should never be allowed, otherwise the tubers are small, and not more numerous.

Water must be given whenever the soil appears dry, and in quantity proportionate to the temperature of the air. Linings must be applied as the temperature declines; and air admitted as freely as the temperature of the atmosphere will allow. Coverings must be afforded with the same regard to temperature.

From six to seven weeks usually elapse between the time of planting and the fitness of the tubers for use. The average produce from a single light is about five pounds.

There is another mode of obtaining young potatoes during the winter, which is much practised on account of its facility; though, being produced without foliage, they are not so fine in flavour, are deficient in farina, and are otherwise inferior. Old potatoes often throw out from their sides young ones early in the spring; and of this habit advantage is taken in obtaining them still earlier. Some full-grown and ripe tubers, of the Early Manly, or other early variety, that have no appearance of vegetating, must be laid alternately with layers of perfectly dry, rich, vegetable mould, four inches deep, in pans or boxes, until they are filled. These may be placed in a thoroughly dry shed, or on a shelf in the kitchen. If the layers are constructed in the corner of a shed or cellar, the produce will be equally good, though longer in coming to perfection. No foliage is produced, the potatoes soon are surrounded by numerous young ones of moderate size. No water must be admitted on any account. Notice is to be taken that between three and four months elapse between the time of forming the layers and the fitness of the produce for use. Thus, if made early in September, the crop will be ready in the course of December. When they are examined, those that are fit may be taken off, and the old potatoes replaced until the remainder are ready. If the potatoes intended for producing young potatoes in this mode produce shoots, these must be rubbed off as often as they appear, until August or Sept. arrives, when they are to be covered with earth as above described. (*Johnson's Mod. Gard. Dict.*)

A mode of forcing, so as to obtain an early spring crop in the open ground, is as follows:—The first week in March dig a trench six inches deep, and two feet wide, put into this a layer four inches thick, of hot-bed dung, place the sets of an early variety on this, cover them with earth, bend sticks over the surface, and give the shelter of mats at night. The young potatoes will be fit for use in the first days of May.

Mr. Mearns recommends for an early crop, on a small scale, raising the plants first in frames, or in a warm border. They should be thickly planted, so as not to take up ground unnecessarily, and when the shoots are from four to six inches high, shake the plants out carefully with a fork, so as not to injure the young roots, and then plant them according to the coiling system. They are best planted in very shallow trenches, if the subsoil is dry, and they should be earthed up by levelling the ground. This is an old practice, that has long gone out of use, as well as that excellent one of using tolerably-well decomposed dung, dug or ploughed in, and well diffused in the soil before planting. The coiling of the shoots in a horizontal position, causes roots to be freely emitted at all the buried joints, and likewise fine tubers. (*Gard. Chron.* 1844, 358.)

In Devonshire and Cornwall, to have the new potatoes ready for use in October, they should be planted about the middle of July; for the principal crop, for winter use, the first week in August is the best time. They should be planted on a good rich border (the drier the better), in rows 2½ feet apart, and about 1 foot from plant to plant. It is necessary to place the rows a good distance apart, in order to insure good foliage by freely admitting the rays of the sun, as well as a good circulation of air, as the quantity as well as quality of the crop depends much upon a proper attention to this point; and it probably might be better attained by placing the rows still further apart. "Potatoes planted in the above way, in August, will be ready for the table in November, and will continue good from that time till April, when it is easy to have a succession from those planted in the spring. The only extra trouble attending upon potatoes when planted at this season (August), is to cover them in winter with leaves, or any other material which will keep out the frost.

" When potatoes are thus managed, any person may insure a supply through the winter of almost as good a quality as those grown during the summer months ; the only difference is, that those planted for the winter are rather more waxy (and particularly so if the situation is damp) than those raised during the summer.

" It is also necessary," Mr. Saul says, " that the potatoes intended for the autumn-planting should be of a late kind, and kept in a cool situation till the season of planting, and also as clear as possible from sprouts during the summer. Much, however, depends (as regards the sorts) on the situation and soil, as if the latter is stiff and the former cold, an early kind is best suited ; but if the situation is a warm one, and the soil light and dry, plant a later sort."

Another mode, and by which a succession to the last-mentioned may be obtained, is as follows :— Plant the second crop in August, 9 inches deep. The plants will be in full leaf during October, and so soon as the stems are affected by the frosts, cut them down to about 6 inches length and cover them entirely with leaves or stubble, placing upon these earth to retain them in their place. The young potatoes will be fit for use in March.

Another mode of forcing the potato is thus detailed by Mr. Marcroft, gardener, at Gledhow House, near Leeds. " We take some turf sods two inches thick, cut them into pieces four or six inches square, and place them, the grassy side downwards, in any convenient place where there is a little heat, such as the stove or the peach house. One whole potato is placed on each piece of turf, and covered lightly over with sand. They remain until they are about three inches high, by which time they will have filled the turfs with roots; they are then removed to the pits, frames, or other sheltered situations, in which they are to be planted. It will be seen that they may be lifted with a good ball, by merely putting the hand under the turfs, and by placing them carefully into a seive, they may be carried, without any injury, to the situation in which they are to be planted, which of course is previously got ready for them; they are planted immediately nine inches apart in the row, and fifteen inches betwixt the rows, and are lightly sprinkled over with tepid water; when this is done with care, they never experience any inconvenience from the removal. They are kept rather close for a few days at first, then a little soil is added, and abundance of air given in favourable weather. By this method there is a great saving of manure, as well as trouble in covering the frames, as it will be seen they have not to remain so long in them as if they were planted in them at first." (*Garden. Journ.* 1846, 168.)

DISEASES.

Every part of the potato is liable to disease and mal-formation.

The *flowers* are especially liable to a defective development of the parts essential to fecundity, and consequently fall without generating seed. This defect, as shewn in a previous section, is intimately connected with the precocious formation of tubers, and that fertility of the blossom is secured by preventing this early development of the root.

The *leaves* are liable to be the victims of that disease so fatal to productiveness—*the curl.* This disease is thus characterized:—Soon after their first appearance the shoots become curled, and make but little progress afterwards; sometimes, indeed, they disappear altogether. Some, however, remain nearly stationary, either not producing blossoms at all, or only very weak ones, which soon fall off and yield no seed. They produce no tubers, or only a few minute ones, which are stony, and unfit for use. These, however, when planted, do not always produce plants infected with the disease. Plants affected by this disease have an extremely meagre appearance. The stem is unbranched, brownish green or mottled, and here and there sprinkled with rusty spots, which penetrate to the pith, so that it is not white but rust coloured, or sometimes black. The upper surface of the leaves is not so smooth as usual, but rough, wrinkled, curled, or crumpled. The leaves are far more sessile than usual, and are not of a uniform brownish or dark green, but spotted. The passages for circulation, inhibition, and respiration, are none of them in a healthy state. The pith is often discoloured or dried even in the young shoots. The starved plant often perishes early in autumn when the tubers should be making the most rapid growth. These are scanty, and tasteless, juicy, and almost unfit for food. Even the colour of the outer coat of the tubers is changed. The same tuber is in parts brown, in parts of a dirty yellow, and sometimes the two tints run into each other. (*Hanover Magazine*, p. 1779.)

Any one can insure the occurrence of this disease by keeping the sets in a situation favourable to their vegetation, as in a warm, damp outhouse, and then rubbing off repeatedly the long shoots they have thrown out. Sets that have been so treated I have invariably found produce curled plants. Is not the reason very apparent? The vital energy had been weakened by the repeated efforts to vegetate ; so that when planted in the soil, their energy was unequal to the perfect development of the parts ; for the curl is nothing more or less than a distorted or incomplete formation of the foliage, preceded by an imperfect production of the fibrous roots.

The variety employed was the Early Shaw. An equal number of whole moderately-sized potatoes, that had been treated in three different modes, were planted the last week in March.

No. 1. Twenty sets that had been carefully kept cold and dry throughout the winter, firm, unshrivelled, and with scarcely any symptoms of vegetation.

No. 2. Twenty sets that had been kept warm and moist, and from which the shoots, after attaining a height of six inches, had been thrice removed.

No. 3. Twenty sets that had been kept warm and moist for about half the time that No. 2 had, and from which the shoots, three inches in length, had been removed only twice.

All the sets were planted the same morning, each exactly six inches below the surface, and each with an unsprouted eye upwards. The spring was genial.

Of No. 1, nineteen plants came up. The twentieth seemed to have been removed by an accident. Of the nineteen not one was curled. The produce a full average crop.

Of No. 2 all came up, but from ten to fourteen days later than those of No. 1, and three of the plants sixteen days later. Fourteen of the plants were curled.

Of No. 3 all came up, but from ten to fourteen days later than those of No. 1. Four plants were as severely curled as those in No. 2, eight were less so, and the remainder not at all; but of these the produce was below an average, and a full fortnight later in ripening.

Dickson, Crichton, Knight, and others, have found that tubers taken up before they are fully ripened produce plants not so liable to the curl as those that have remained in the ground until completely perfected; and I believe under ordinary treatment this to be the fact, for it is rational. The process of ripening proceeds in the potato, as in the apple, after it has been gathered; and until that is perfected it is accumulating vigour, shows no appetency to vegetate, consequently is not exhausting its vitality, which is a great point, considering the careless mode usually adopted to store them through the winter; for this energy commences its decline from the moment it begins to develop the parts of the future plant. Tubers taken from the soil before perfectly ripe, never are so early in showing symptoms of vegetation. Crichton, Hunter, and Young, in some of the works before referred to, have also agreed that exposing the sets to light and air, allowing them to become dry and shrivelled, also induces the curl in the plants arising from them. This result of experience also confirms my conclusion, that the disease arises from deficient energy; for no process more than this drying one of exposure to the light and air, tends to take away from a tuber the power of vegetating altogether.

Every one acquainted with the cultivation of the potato, is aware of the great difference existing in the varieties: as to their early and rapid vegetation, those that excel in this quality are of course the more easily excitable. A consequence of this is, that they are always planted earliest in the spring, before their vital power has become very active; and of all crops, practice demonstrates that these early ones are least liable to the curl. But what is the consequence, on the contrary, if an early variety is planted for a main crop later in the spring, when extraordinary pains in keeping them cold have not been employed to check their vegetation, and consequent decrease of vital energy? Such crop, then, is more than any other liable to the disease, and a good preventive has been suggested by Dr. Lindley, namely, that of planting the tubers in autumn, immediately after they have ripened. The results of my view of the disease, sustained by numerous experiments, are, that it will never occur if the following points are attended to: —First, that the sets are from the tubers that exhibit scarcely any symptoms of incipient vegetation; to effect which they ought, throughout the winter, to be preserved as cool and as much excluded from the air as possible. Secondly, that the tubers should be perfectly ripened. Thirdly, that they should be planted whole, or immediately after they are cut, and in the autumn, at the time of taking up the crop. Fourthly, the manure applied should be spread regularly, and mixed with the soil, and not along a trench in immediate contact with the sets. Fifthly, that the crop is not raised for several successive years on the same area. (*Johnson's Modern Gard. Dict.*)

Super-tuberation.—Increase and multiply, and replenish the earth, was an ordinance directed to, and implicitly obeyed by, all organized beings. In the vegetable kingdom it is more strenuously followed, even, than in the animal; for almost all plants, if prevented from exercising the usual mode of propagation, succeed in effecting it by some other means. Herbaceous plants, shrubs, &c., if prevented advancing to seed by having their stems cut down, endeavour to extend themselves by suckers; bulbs prevented flowering are more prolific of offsets; and tuber-bearing plants are by similar treatment rendered excessively productive of tubers. This is most remarkably the case with the potato.

We have seen, that if prevented producing stems, an old tuber emits other tubers around itself, and this habit is taken advantage of by the gardener to obtain young potatoes for the table. The same consequence occurs if the sets are planted too deep, or if they are exhausted of vital energy by being over-heated in clamps, by being kept out of the soil a great length of time, or other causes. That defect of vital energy, or exhaustion is the cause, is rendered more probable by the fact, that in some experiments tried in the garden of the Horticultural Society, it was found that potatoes tardy in vegetating, and which had not put forth stems, speedily did so, and became the most vigorous when treated with a stimulant, such as a weak solution of sal ammoniac, muriate of ammonia.

The following particulars are communicated by Sir Charles Lemon. The sets appear to sprout as they ought, and as others which surround them in the same field have done, but they are stopped short before they reach the surface and no leaves are formed. Large patches in the field are thus left bare, and when the ridges are dug up, it is found that these abortive sets have formed each a little button, about two or three inches from the surface, and, as it were, gone to rest after the effort. The disease produced no very sensible effects on the crop till about four or five years ago; but I have been informed by a farmer near Truro, that he recollects a few instances in which these little dwarfs, called by the country people "Bobbin Joans," were noticed as long ago as 30 years.

In the neighbourhood of Penzance, a great potato country, the failure of crops from this cause has been more general and more destructive than in this part of the country, in some instances destroying one-third of the produce. Sets from a field which was much infested with "Bobbin Joans," and planted in new ground, produced a crop in which there were some, but not very many, of these abortions.

Moreover (says Sir C. Lemon), I have planted in garden ground, the very "Bobbin Joans" themselves, in which, if any where, the disease must have prevailed, and in due time I dug up an abundant return of potatoes, every one of which was sound and of full size. From a heap of potatoes lately turned, some of which had shot out to a considerable length, two or three examples have been brought to me in which the shoot had been suddenly stopped by a small tuber. On cutting open the potato, I found that the inner substance had entirely decayed away, and not more than half an inch remained of the interior substance. This, however, appeared to be perfectly sound. Furthermore, on referring again to the farmer, from whose field I first got the "Bobbin Joans," and who had suffered severely in his crop in the season before last. I learnt that the potatoes from which he had taken the sets which produce the defective crop, had been drawn in very wet weather, and stowed away without being dried. They had remained in that state, and I have no doubt that incipient decay, though unperceived when the potatoes were cut, had produced some change in the substance unfavourable to the growth of the set.

Heating by fermentation, or from any other cause, and perhaps frost, may produce the same sort of disorganization; and I think it is not difficult to conceive that the starch of the potato, being prematurely changed into sugar, and dissipated before the young plant is in a condition to absorb it, the set may be rendered unable to afford the nourishment requisite for healthy growth. What remains of the original substance may be simply transferred to the little tuber, as the substance of the cotyledons of a bean are transferred to the root leaves, before those leaves have begun to perform their functions, and attract from the atmosphere the proper nourishment for the infant shoot. (*Gard. Chron.*, 1843, 524.)

Dry Rot, or *Dry Gangrene*, has never been so prevalent in this country as to have obtained any particular attention. I have occasionally noticed it, and have found the symptoms in every instance accordant with those observed by Von Martius, and which will be immediately detailed. I have no reason to doubt that the potatoes affected with this total inability to vegetate, have had their vital energy still more completely exhausted than those reduced to supertuberation. No stimulants have any effect in inducing tubers affected with dry rot to vegetate, I have watered them with weak solutions of carbonate of ammonia, and of muriate of ammonia, and have placed them in the earth of a strongly fermenting hot-bed, without being able to arouse their vitality. I have never observed potatoes affected with this disease which have been left in the soil until required.

Von Martius calls it *Gangræna tuberum solani*, and thus particularizes its phenomena.

When potatoes are attacked with this disease, the first thing that is observed is a drying-up, or shriveling of the tuber. The skin loses its ordinary lustre, becomes wrinkled, and shows, at last, little irregular spots of a dark brown colour, which, as the disease progresses, run together into larger spots. In these places the skin seems thicker, and has the appearance of having been rubbed against something.

Subsequently the tissue of which the skin is composed, becomes loosened and torn; and by the breaking-up of its continuity, it assumes the appearance of the bark of an old tree. Sometimes the skin is split up into distinct patches, like scales.

At the commencement of the disease, the interior of the tuber does not suffer, but, at last, a change of colour takes place in the tissue under the spots on the skin. Patches of a yellow or brown colour are observed, which are at first isolated, but at last run one into the other, these patches are drier than the surrounding tissue; but up to this period, in the appearances of the disease, no changes have taken place that render the tuber unfit to eat. As the disease advances, little warts or excrescences form in the skin, which are of a dark colour inside; they are at first small, but keep on extending, and at last run into the other.

From the surface of these warts a fungus, belonging to the mould tribe is observed to project.

The potato now begins to emit a disagreeable odour, and its physical character is generally changed.

Its specific gravity, which in a state of health is 1.163, becomes successively reduced as the disease proceeds, and at last is about 0.9. When in this state, it is frequently attacked by a species of mite, Acarus farinæ, which feeds upon the grains of starch. If the potatoes are planted with this disease, in no case do they put forth healthy shoots. In the commencing stages, the eyes put forth shoots which rise above the ground, but soon perish. In the latter stages, the whole tissue of the potato is involved in the disease, and on cutting into it, it presents a dark-coloured disorganized mass, very dry, and not unlike the appearance of a truffle. The attempt at putting forth shoots now results in the formation of little knobs, varying in size from a quarter of an inch to an inch in circumference, and having a red or rose colour on the outside. On examining the tissues under a microscope, it will be found that the cellular tissue of the skin has lost its transparency and become of a brown colour, and that of the interior has lost its brightness, as well as its moisture and whiteness. The starch grains gradually disappear, and cells filled with air, and a yellow matter occupy their place. Many of the cells are torn, and the intercellular passages are filled with a brown fluid. Scattered between the cells in all directions will be seen dark-coloured, opaque grains, of varying form and size.

These grains do not develop any further, but at last burst, and in their appearance and history resemble the protomyces, or primitive fungus germs of Unger. On cutting into the little knobs, masses of the fibres of a fungus are observed, which at last make their way to the surface, and there either fructify or become shrivelled into a whitish layer. Sometimes the fibres of this fungus, which are very delicate and transparent, are found throughout the whole mass of the diseased tuber. On examining these fibres, they present two distinct forms, the one being probably a variety of the other. Martius has named it, Fusisporiam solani.

Potatoes thus diseased have been chemically examined by Dr. Buchner. The starch of the potato does not appear to undergo much change as long as the tubers are kept from the influence of moisture, or that the dry form of the gangrene does not give way to a moist one, which is sometimes the case. The albumen of the potato entirely disappears. The greatest alteration is in the water, which is reduced to half the quantity that exists in healthy potatoes.

In healthy potatoes, the water is		..	73	parts.
In diseased	,,	,, ..	35	,,
In healthy potatoes, the dry matter is			26	,,
In diseased	,,	,, ..	64	,,

The lignin becomes of a brown colour, and is converted into humus. A more accurate analysis than the above has not at present been obtained.

The following, however, is an analysis of healthy potatoes, by Plaff:—

Water	76.6
Starch	11.2
Lignin	7.8
Mucus and salts.. ..	3.7
Albumen	0.7

These figures are the mean of nineteen analyses. (See p. 34.)

With regard to the causes of this disease, nothing certain is at present known. In Germany it has occurred in all soils, and in all weathers.

It has occurred to almost all sorts of potatoes, and after all modes of planting and gathering, so that many have been inclined to attribute it to the influence of contagion; whilst those who are advocates of the doctrine, that all diseases spring from the sporules of fungi, will at once conclude that the existence of the fungus in this disease is a proof of its having originated in their presence.

The conclusions of Von Martius are as follows:— The newer the variety is the better. The potatoes intended for seed should be grown separate from the rest. The seed potatoes should not be kept heaped up in damp cellars, and allowed to shoot before they are planted, and they should never be cut for sowing till they are brought into the field. (*Gard. Chron.* 1844, 163.)

Moist Gangrene or *Potato Murrain.*—This disease was most extensively destructive of the tubers of the potato crop in the British Islands in 1845 and 1846. But it is not a new disease to the vegetable nosologist, nor confined to these Islands.

In July, August, or early in September, whilst the fibres connecting the tubers with the stem are still full of sap and the vital circulation is still in force, this disease makes its appearance. The leaves and stems become blotched with black decayed parts: the putrefaction or ulceration is moist, and, if the weather be wet and ungenial, proceeds so rapidly, that an unpleasant effluvium is very perceptibly evolved. The stems ulcerating and decaying whilst the fibres connecting the tubers with them are still vigorous, the infectious ichor is communicated with the sap, and passing into the still immature and juicy tubers imparts to them the gangrene. The infection is first apparent at the end nearest the connecting fibre, spreads gradually throughout the liber of the tuber (see *Frontispiece*), rendering it brown like a decayed apple; and lastly, causing the putrefaction of the whole interior. Previously to this final decay the increased specific gravity of the tuber is very remarkable, amounting to about one-third more than when the potato is healthy. When boiled the infected portions become black; but when submitted to a dry heat of about 200 deg. they rapidly part with moisture, and the progress of the ulceration is checked, if not entirely stopped.

When the disease makes its appearance before the stems and foliage are dead, it has been judiciously recommended by Dr. Lindley that these should be *pulled up*. This of course prevents the communication of infected sap to the tubers. Cutting off the stems has been found ineffectual, apparently because some of the stem then remains to impart the sap. Messrs. Dillistone, of Sturmer Nursery, Suffolk, say: "We tried the plan of pulling up the haulm immediately upon perceiving the disease this year on the early varieties (viz. Shaws, Ash-leaved Kidney, &c.), and the result is all that could be desired. We have lost scarcely any. The tops were left on the ends of some rows of Shaws for the sake of experiment, but nearly all the potatoes spoiled. Mowing off the tops we find to be useless."

It has been suggested that either fungi or insects are the cause of the disease; but I think both these are excluded by the fact that it appears in every quarter and latitude of the globe—in the frigid climate of North America, in the temperate locality of Devonshire, and between the tropics at St. Helena. Now, I know of no fungus or insect that has its habitat alike uninfluenced by heat or cold; and even less conceivable is it that a fungus or insect is just created for the purpose of destroying the potato crop. The fungus or insect, it is more rational to conclude, must have existed throughout time, and its ravages have only been felt by increasing degrees, as the potato has gradually reached a state of disease fitted for the nutriment of the parasite. The same and other facts preclude unfavourable seasons from being the *cause* of the disease, though they may hasten its progress. The disease was quite as prevalent in 1846 as in 1845, yet no two years could have had seasons more different. It is quite clear that no local cause—such as the employment of any particular manure, the staple of the soil, or the mode of culture—can be the origin of the disease, for the crop has been grown on all possible varieties of arable soil, with and without manures, and in various modes; the sets have been dug in and dibbled in; the plants have been earthed up and left unearthed; yet in all and in each has the disease appeared. The cause, then, must be one of universal applicability, for the disease is epidemic in the widest sense of the term. Does it arise from the vital powers of the varieties being exhausted? No; for, in many instances, the most recently raised from seed are as productive of diseased tubers as the oldest cultivated kinds. Does it arise from the almost universal practice of taking up the tubers as soon as the stems are dying or dead, and keeping those tubers out of the soil for four, five, or more months? I am of opinion that this is the cause. The practice is nearly universal: it is the practice throughout Europe, as it is in America, St. Helena, and the hill districts of Hindostan; and in all those regions the disease prevails. It is not the practice in New Zealand, and there the disease is unknown.

Now, has the withdrawal of bulbs and tubers from the soil the effect of gradually rendering them and their progeny diseased? I think no horticulturist or vegetable physiologist will answer in the negative. A writer in the *Gardener's Chronicle* of the year 1846 (p. 478), most correctly observes, that the bulbs of hyacinths, tulips, and crocuses, keep well in the ground, but, if taken up, have a strong tendency to decay. But what effect has this treatment upon the plants to which they give birth? Why, it imparts to them disease. The strain, the beauteous variegation of the tulip's petals, are the effects of disease. Leave the bulb in the soil throughout the year, and it returns to its natural vigour and simple colours. No variety occasioned and preserved by such artificial treatment will endure beyond a few years. It is no effectual objection that seedling potatoes are now affected with the same disease, for such diseases are hereditary in vegetables as well as in animals, and the seedling's tubers have been subjected to the same keeping out of the soil for months as were its parents. Neither is it an effectual objection to say that only of late years the disease has prevailed, for it has been noticed for full fifteen years, and it is only by such detention from the soil through a series of years that the disease is advanced to its prevailing malignant form. It is only thus that varieties of the tulip and dahlia are gradually destroyed.*

Tubers and bulbs kept out of the soil, whether freely exposed or in covered heaps, all undergo the same chemical changes—absorbing oxygen and emitting carbonic acid; and the longer they are so kept, so, proportionately, does all experience shew that they lose the power of healthy vegetation. In the potato so treated the foliage produced is diminished, and liable to the curl and its premature decay; and I have a strong opinion that the small produce and early decay of the tubers has its origin from the same cause.

I quite agree with Dr. Lyon Playfair in thinking that the disease itself is an ulceration or decay of the potato tissue, arising first in the sap of the leaves, and, like all other putrefactions, attended by the phe-

* It is no new disease—no modern introduction into the lists of vegetable nosology. I have noticed it for the last fifteen years. From 1830 to 1841 it seriously injured the potato crops of Germany, and is noticed by M. Von Martius as the *Potato Gangrene.—Von Martius " On the Epidemics of Potatoes."*

nomenon of combination with an unnatural large amount of oxygen. The diseased spots in the tubers appear first near the spiral vessels, which convey air to the internal cells. The rapid decay of the cells, I agree with Dr. Playfair in thinking, arises from their unnaturally weak constitution—a weakness we have already seen, from Mr. Grey's experiments and almost universal experience, occasioned by a lengthened detention of the tubers from the soil. But whether this detention is or is not the cause of the disease matters little in comparison with the fact that early autumn-planting is a preventive of its occurrence. If its cause be either parasitic fungi or insects, still early autumn-planting is an effectual remedy; for, usually, the parasites do not make their appearance until August, by which time, if early autumn-planting be adopted, the tubers are ripened, and the fibres connecting them with the stem are dead, and cannot communicate the infection.

I would earnestly impress upon every one to throw aside all prejudice upon this highly important point, and not to prejudge without a trial. Let the directions here given be strictly followed, and I have no doubt that the potato murrain will become of trifling consequence just in proportion as PLANTING IN SEPTEMBER AND OCTOBER becomes the general practice.* Such a mass of evidence as is here gathered

* Although these are the best times, yet, for planting, any

together, from every district of the British islands, is above suspicion; and he will do a service to his country who not only tries this easy remedy himself, but sees that it is made known to, and tried by, his cottage neighbours.

To all I say, do not take it for granted one way or the other: it is easy to ask the question of Nature, by planting some potatoes next September. *Her* reply may be depended upon.

It deserves to be generally known, considering the ignorant and false reports disseminated to the contrary, than gangrened potatoes are *not* poisonous.

A curious and sufficiently practical experiment, as to the possibility of eating such potatoes without danger, has been tried by H. Boujean, of Chambery, who states in the *Monde*, a French newspaper, that he has been living almost exclusively, for three consecutive days, upon bad potatoes, which had been thrown aside as refuse. M. Boujean states—" In order to

time in autumn is to be prefered to winter, and much more to spring. If the potatoes are kept in the earth where grown, or undried by exposure to the air, until required for planting, November may be found a very good time; yet early autumn-planting is to be prefered. By *early* autumn-planting I mean planting in September and October, and I protest against any unfavourable results from crops planted in any subsequent month being taken as evidence against my recommendation. Planting in November is *late* autumn-planting, and when done in December, January, or February, it is *winter* planting.

determine the question, with regard to the danger of eating the affected potatoes, I had none of the injured portions cut away from the tubers, on which I lived almost exclusively for three whole days, during which time I eat 8 lbs. with butter in soup, or simply cooked in water, without experiencing any inconvenience, except slight indigestion, a symptom which would probably not have manifested itself if the spoiled portions had been previously removed. Further, I have drank in the morning, fasting, a glass, about 8 ozs., of water, in which 5 lbs. of putrid tubers had been boiled; it was yellowish brown, turbid, and thick, but not viscous, of a slightly disagreeable smell and nauseous taste, leaving a bitterness which remained on the palate for an hour. I found no other symptoms of indigestion from this liquid, except a disagreeable heat oppressing the chest for about two hours. My two clerks and servant observing that I felt no repugnance in eating these potatoes, and that no inconvenience resulted, followed my example next day, and were nothing worse." (*Le Monde*, Oct., 1845.)

Attendant upon this disease is a microscopic fungus, which has been named *Botrytis infestans*. Dr. Morren, M. Payens, and the Rev. M. J. Berkeley, consider it the cause of the disease, but I have already stated my reasons for considering this an unjustified conclusion. The peculiar characters of this species are the few erecto-patent, not forcipated or uncinated branches; the scattered spores; and above all, the torulose swellings, which give it somewhat the appearance of *Gonatobotrys*. It first makes its appearance upon the foliage, and afterwards upon the tubers, but never until *after* decay has commenced. (*Hort. Soc. Journ.* i. 31.)

Mildew, or *rust*, is very common upon the foliage of over-luxuriant potatoes, especially in wet seasons. It is evidently, like the disease of the same name, which affects our wheat crops, and the berberry, a parasitic fungus. The Rev. Mr. Berkeley has extracted the following very correct observations upon it, from a work published at Weimar, in 1819, entitled "A Monograph of Potatoes."

Rust-coloured spots appear upon the leaves, which are at first small, but gradually increase, and at length over-run the whole leaf. As the respiration of the leaves is in consequence impeded, the stems are thin, and at last wither. When, however, this does not take place, the flesh of the tubers is infested with black knots, which resemble ulcers, and are harder and more fibrous than the rest of the flesh.

The cause of this disease is unknown. It is often only of short duration, and is ameliorated by mild rains, so that the produce is not much affected. The nature of this disease is evidently very obscure. It is probably the same mentioned by Staudinger, in the Isis of 1832, as occurring at Altona, in land highly manured with herrings. (*Gard. Chron.* 1845, 624.).

Blue Pock. This is a disease which I have never observed upon the potato, and M. Von Martius was equally without experience when writing of it in his work on the potato diseases. Like him, I must trust to the particulars given by M. Hampa, who describes it as first appearing under the form of blue spots and elevations on the skin of the tubers.

At a late period, dark rhizomorpha-like threads (probably the mycelium of a fungus) invest the tubers, or even penetrate their substance. Blue spots and stripes at length appear in the flesh of the tubers, which are not eatable. It is said that the disease arises in very wet weather.

USES.

Not a portion of the potato—neither its flowers, its leaves, its stems, nor its roots—but is subservient to the welfare and convenience of man.

Its green tops are good when boiled as spinach; and from its leaves and flowers, Dr. Latham extracted an anodyne medicine. From its stems is obtained, in Austria, a soft and useful flax, and if burned they yield potash almost as abundantly as the wormwood.

The blossoms yield a very beautiful yellow dye, and from its berries, when ripe and fermented, is obtained a spirit and vinegar.

But its tubers are the part of far greatest utility, and for which its culture has been extended to a limit inferior to none but that of the cereal grasses. Omitting altogether the rest of Europe, and other countries of our globe, and confining our attention to the British Isles, we shall find that it is one of the most important sources of sustenance to which the cultivator directs his attention. In England, Scotland, and Wales, every individual, on an average, consumes at least one pound of potatoes daily, so that about 19,000,000 lbs. are *daily* required for the sustenance of their inhabitants! In Ireland the consumption is still greater, and here I will quote the words of Dr. Lindley, who has examined into the question more closely than myself.

It is stated that 4,500,000 persons in Ireland are fed upon potatoes alone. The usual allowance of potatoes to a labouring man is 14 lbs. per diem, and therefore, we may assume that, making reductions for women and children, 10 lbs. per diem are consumed by each of these persons; therefore, 45,000,000 lbs. of potatoes *per diem* must be eaten in Ireland by this part of the population alone.

We do not, however, imagine that an exclusive potato diet extends over the whole year. We can only regard it as the exclusive food of the peasantry for eight months in a year.

The average quantity of potatoes obtained from an acre of land in England may be estimated at 8 tons, or, allowing 1 ton for seed, at 7 tons net. This being the case, we arrive at the conclusion, that the potato crop of Ireland, for the mere consumption of those who feed upon it exclusively, amounts to the immense quantity of 10,800,000,000 lbs., and requires for its production 688,647 English acres of land. But to this we must add the potato diet of 3,500,000 persons who only fed upon potatoes in part. If we take the consumption by these at 1 lb. per head per diem for the whole year, and also assume that during the four months previously excepted, 1 lb. per head per diem is also required for the rest of the population already taken at 4,500,000, we shall find the whole consumption of potatoes in Ireland to amount to 12,617,500,000 lbs. per annum; for producing which, 804,687 English acres must be under potato cultivation.

In ordinary tillage, 1 ton of potatoes is required per acre for seed. Therefore, merely to plant as much land as seems necessary to feed the Irish population, would consume above 800,000 tons, and require 100,000 acres of land in addition.

But as Ireland is an exporting country, sending her potatoes elsewhere in large quantities, it may not be too much to assume that the numbers of statute acres under cropping with this plant is a million, or about one-fourteenth of the whole cultivated land. (*Gard. Chron.*, 1845, 783.)

The various modes and forms in which the potato is prepared for table uses, do not come within the purposes of this work, and for them I will refer my readers to other volumes in which will be found recipes for "potato salad," "potato pudding," "potato pie," "potato tart," "potato fritters," "potato cheesecakes," "potato paste," "potato rolls," &c. But the employment of this tuber in the making of bread and biscuits is so important, as a national resource in the time of corn-scarcity, that an approved formula for their preparation may be admitted without excuse.

Potato Bread. Boil five pounds of potatoes well, dry them in the oven till they fall to pieces and become flour, which they will do if properly managed. Then make it into a batter, about the consistency of gruel, strain this through a coarse sieve, and mix it with twenty pounds of flour, instead of using water. If your yeast is good, this bread will be very light and agreeable.

Potato Biscuits.—Wash or peel the potatoes, then boil or steam them and mash them into a pulp, take flour, either of wheat, barley, oats, or pulse, according to the circumstances of the party, sufficient to work or need up into as thick a dough as possible, roll it out into thin sheets, the size of the gridle or frying-pan, allow it to stay half a minute over the fire, then turn it, and in half a minute more it is done. The dryer the potatoes are boiled the less flour they will take to work them up, and of course the quality (not the nourishment) will depend in a great measure on the quality of the flour used. Such cakes may be stored away one above another in any dry place. This biscuit or thin cake is much used in Norway, and is most palatable, and will keep any length of time.

It deserves observation that arrow-root, tapioca, and similar preparations for the infant and the sick, are merely starch obtained from some plant, and that in most instances the said plant is the potato! Potato starch is imported in large quantities from Belgium, as a beautifully white but rather harshly feeling powder, and is vended here in packets, with various attractive names, at prices varying from 1s. 6d. to 2s. 6d. per lb.

As a food for horses, oxen, cows, and pigs, the potato is most excellent if cooked previously to its being given to them. In its raw state it is not only innutritious but highly laxative. Boiling is the usual mode of preparing this root for agricultural stock, but roasting, or highly kiln-drying is more economical, for this process renders it more nutritious with less waste. I have experienced this in feeding pigs, and the following statement bears testimony in favour of its similar treatment for the horse.

"Some years since," "says a trustworthy writer, "I heard this remark :—'Boiled potatoes are four times as good as raw, and roast potatoes are four times as good as boiled; *ergo,* roast potatoes are sixteen times as good as raw for a horse.' "

"Experience has, I think, convinced me that this is a fact, because I have ever since roasted potatoes for my horse—a good, sound, general horse for saddle or harness—as long through the season as potatoes may be considered wholesome for man or beast.

My horse is very fond of them, and the more they are roasted the better he likes them, and the more good they appear to do him. I cook them in the same way for my pig, and, I think, with equal advantage. By the term roasted, I mean what in Lancashire is called roasted; they are put into on iron pot without water, and if they remain on the fire till they are black, and will mash with ease, they are, I think, all the better for it.

"The quantity it may be proper to give a horse per diem I am not prepared to state; I give my horse about two-thirds of a peck for his supper, and I am of opinion, when he has slow work to do, the same quantity may be given to advantage at any time of the day; but I would not give a horse potatoes immediately before I was going a journey in haste with him.

"As a proof that the mode of feeding is good, I may state that my horse is as fresh and sound as ever he was, is eleven years old, and I have had him seven years. If the potatoes are roasted till they are brown, or till all the moisture is out of them, they will do very well; but if roasted till the skin is black, there is no objection to it. The horse eats all, but if not cut into slices of moderate thickness before they are put over the fire, it is well to crush them a little lest a horse in his eagerness to devour them should choke himself. If a horse should have two feeds of potatoes in a day I am of opinion that with regular gentle exercise he will do very well with only one good feed of oats."

Mr. Garroll, of Old Court, near Cork, says, that potatoes, in the absence of green or other succulent food, have been found in Ireland highly advantageous food for brood-mares having early foals, say from December to May; they have been found equally so for weaning colts from October to May. They have been also given with success to draft horses, two feeds each day of 21 lbs. each feed, with one feed of 7 lbs. of oats, and the usual quantity of hay (14 lbs. to 18 lbs.) at night. I have, with many others similarly circumstanced, used them advantageously on all the above occasions, but their use is now becoming superseded, as food for horses, by the introduction of turnip culture. They are used as food for horses by a class of men in this neighbourhood who live by the hard work their horses perform, namely, the carmen, or "gingle boys" as they are called, who are employed conveying passengers to and fro about Cork. Those "gingle horses" perform journeys of from 30 to 45 miles daily on two feeds of oats of 7 lbs. each, one of potatoes, and bran at night (21 lbs. of the former and 7 lbs. of the latter) with 14 lbs. of hay. The practice formerly was four feeds of oats daily and hay at night, but since they began to use potatoes they find their horses do more work, and are in better condition. (*Gard. Chron.* 1841, 117.)

When, from potatoes not keeping, or other cause, it is desirable to obtain from them the starch which they contain, the following is the most simple process that can be adopted:—When 12lbs. of flour can be extracted from a bushel of sound potatoes, 8lbs. can be procured from such as have become so far decayed as to be useless as an article of food. To obtain the flour separate from the decaying cells, the potatoes should be first very thoroughly washed, so that not a particle of dirt remains upon them; they should then be finely grated with a bread grater into a tub of water, and the pulp well stirred about to separate the particles of starch as much as possible from their cells. The whole should then be left to settle, and the heavies particles of starch would soon fall to the bottom, whilst the lighter skin and cells would settle above them, and may be poured off with the water. The mass of flour formed by the settling of the particles should be washed two or three times more, by pouring water upon it and stirring it about, and again leaving it to settle as before. After the flour is considered to be sufficiently washed, it must be spread upon a cloth placed on a board in the sun, or in a warm room, to dry; or it may be dried in the oven after the bread has been removed. It may then be kept for any length of time, and when wanted, used like wheat flour for making puddings, &c. This process will be sufficient for common purposes; but a more perfect method may be described, by which the potato flour can be procured in its purest state; in which it is frequently sold for arrow-root, and by a variety of other names, as a delicate food for weak digestions, for children, and for the sick. The more perfect process for obtaining the flour in the form of "British arrow-root" is as follows:—Thoroughly wash the potatoes; peel away the skin, without cutting off much; grate the peeled potatoes finely into a pulp; place the pulp on a hair sieve, pour water over it, stirring it up well, till the water ceases to pass through with a milky appearance; the pulp left on the sieve may be thrown away, and the milky water put aside to settle; when the particles of starch have all settled, the water should be poured off, and fresh water added, the whole stirred up afresh, and allowed to settle again; these washings may be repeated four or five times, when the starch will have assumed the character of arrow-root, and will have become white as snow, whilst the water will now be perfectly clear; the prepared flour must be thoroughly dried, and may be kept for any length of time in jars or casks.

INSECTS FOUND ON THE POTATO.

Potato Frog-Fly. (Eupteryx solani.)—This little insect appears in August, and is found on the underside of the leaves; but it does not appear that any decided injury arises from its presence, although its abstraction of the sap must, in some degree, decrease the produce of tubers. Mr. Curtis says—"When and where the eggs are laid we know not, but the larvæ are little shy green animals, similar to the perfect insect, but destitute of wings. As the larvæ grow, they change their skins, which are left sticking to the leaves, and in due course a pair of lobes become visible in each side of the back, and it is then considered to be in the pupa state. During all these periods of growth the animal subsists by piercing the cuticle of the plant with its rostrum, and imbibing the sap; at the same time causing a wound which interferes with the healthy circulation in the leaf or stem, and robbing it of the full supply of nutriment. This pupa is narrow, about one line long, of a green colour, probably sometimes inclined more or less to a yellow tint; and the abdomen tapers considerably; the head is broad, with two long antennæ, like fine black bristles; two large eyes; the face is greatly elongated and attenuated to the extremity, where the rostrum is attached, and passes along the breast between the hinder coxæ; it is flexible, composed of three joints, with the mandibles and maxillæ like bristles, distinctly visible at the apex; the sheaths inclosing the wings look like the pinions of a bird; and it has six legs, the hinder pair being the longest. Eventually the skin of this pupa bursts upon the back, and out crawls the perfect Eupteryx solani, which is a winged insect, and it can leap, I expect, as well as fly short distances. It is likewise of an agreeable green colour, but becomes of a yellowish green when dead. The head is broader and shorter than it was in the pupa, and of a crescent shape above, with a brown prominent eye on each side; the face, however, which is nearly horizontal, is very long and somewhat ovate, producing a rostrum as in the pupa, also two antennæ, which are shorter, composed of two small sublobose joints, inserted in cavities before the eyes, each furnished with a bristle; the thorax is transverse and smooth; the scutellum is subtrigonate, acuminated at the apex; the abdomen is attenuated, conical in the female, with a long and stout ovipositor, formed of sheaths enclosing the oviduct; wings when at rest, lying over the body in a convex form; the elytra or superior wings are twice as long as the body, narrow and elliptical, the nervures scarcely visible; inferior wings, nearly as long as the elytra, broader, excessively delicate and iridescent; legs, six, very slender, anterior short, hinder very long; thighs short and slender; shanks, anterior armed with spines on the inside only, and not to the apex; hinder long, with a double series of spiny bristles on the outside; feet moderately and triarticulate; claws and pulvilli minute. (*Ibid.* 1846, 388.)

Phytocoris Lineolaris. (Capsus oblineatus of Say.) This hemipterous insect has been found infesting the potato crop in the United States, from the end of spring to the commencement of autumn. It is believed to feed upon the sap of the plants, and is thus mentioned by Dr. Harris:—

During the summer of 1838, and particularly in the early part of the season, which, it will be recollected, was very dry, our gardens and fields swarmed with immense numbers of little bugs, that attacked almost all kinds of herbaceous plants. My attention was first drawn to them in consequence of the injury sustained by a few dahlias, marigolds, asters, and balsams, with which I had stocked a little border around my house. In the garden of my friends, the Messrs. Hovey, at Cambridgeport, I observed, about the same time, that these insects were committing sad havoc, and was informed that various means had been tried to destroy or expel them without effect. On visiting my potato patch shortly afterwards, I found the insects there also in great numbers on the vines; and from information worthy of credit, am inclined to believe that these insects contributed quite as much as the dry weather of that season to diminish the produce of the potato-fields in this vicinity. They principally attacked the buds, terminal shoots, and most succulent growing parts of these and other herbaceous plants, puncturing them with their beaks, drawing off the sap, and, from the effects visible, apparently poisoning the parts attacked. These shortly after withered, turning black, and in a few days dried up, curled, and remained permanently stunted in their growth. Early in the morning the bugs would be found buried among the little expanding leaves of the growing extremities of the plants, at which time it was not very difficult to catch them; but after they had become warmed a little by the sun, they became exceedingly active, and on the approach of the fingers would loose their hold, and either drop suddenly or fly away. Sometimes, too, when on the stem of a plant, they would dodge round to the other side, and thus elude a grasp. (*Harris's Treat. on Insects*, 163.)

Potato Thrips. (Thrips minutissima.) — Mr.

Barnes, of Bicton, and some other persons, whose opinions are equally worthy of consideration, have considered that the potato murrain of 1845-6 was caused by the poisoned wounds given to the leaves of the plants by this insect, whilst robbing them of their sap. I do not coincide in this opinion, for several reasons; and among these, because I have observed the thrips abundantly upon my autumn-planted potatoes, which were free from the disease; and Mr. Curtis says, that, on a crop very much infected, he found only one thrips, and that in the larva state.

This larva is ochreous and shuttle-shaped; *the* head is small and oval, with a minute black eye on each side, and a short beak beneath; the horns are twice as long as the head, slightly pubescent, and four-jointed; two first joints, small; third, egg-shaped; fourth, nearly as long as the others united, ovate at the base, and attenuated to the apex; thorax, very long and broad, composed of three segments, the first trigonate, the angles rounded; the two following segments forming broad bands; the abdomen is as broad as the thorax, composed of nine segments, conical and hairy at the apex; six legs, short; thighs, very short; tibia, dilated; tarsi, indistinct or wanting. The pupæ are also ochreous, but when they change to the perfect state they are much darker, and such atoms that they are not easily detected under the leaves when at rest, and lying close to the midrib, or nervures, but they run about actively enough when disturbed. Thrips minutissima is entirely of a feruginous or ochreous tint, excepting the abdomen, which is brown above, with ochreous spots; the autennæ are placed in front of the head, and are longer and slenderer than those of the larvæ, and six jointed; the joints are furnished with a few short hairs, the basal one is nearly concealed; second, stout, obovate, obtuse; three following, sub-elliptical and more slender; sixth, the longest, attenuated to the apex, and appearing articulated; head depressed, semi-orbicular, with three transparent ocelli; eyes large, black, lateral, and coarsely granulated; rostrum, forming a short beak under the inclined face, close to the anterior coxæ, with palpi and mandibles, the bristle-like maxillæ passing through the rostrum; prothorax, broader than the head, transverse, the angles rounded; abdomen, nine jointed, broader than the thorax, elongate, ovate, the apex conical, bristly, and furnished with an incurved ovipositor; wings incumbent, and parallel in repose, longer than the body, very narrow, lanceolate, semitransparent, pale tawny; superior the broadest, pubescent, with two nervures, costa bristly; inferior margin and apex with long cilia; under wings with one nervure, bristly, and ciliated like the others; six short, stout, pubescent legs, remote, clear ochreous; posterior coxæ approximating, thighs broad, tibiæ clavate: tarsæ rather short and slender, biarticulate; second joint bladder formed. These insects, although not extensive in varieties, occasionally appear in vast quantities.

On a former occasion, Mr. Curtis described and figured a species which does much mischief to wall fruit, and another that is very injurious in hothouses; and every cultivator of melons and cucumbers is too well acquainted with the ravages committed by one of these little creatures, which blights the leaves, causes them to shrivel, and destroys the plant.

The thrips being provided with a short beak, which thrusts through the cuticle into the stalk or leaf, extracts the sap in the same way as the aphides; and judging from the depredations of other species, there can be little doubt that the thrips may be quite capable of injuring the leaves and haulm; but whether it causes the mischief which Mr. Barnes attributes to it, remains to be proved. We sincerely wish he may be able to establish his theory, adds Mr. Curtis, as it would at once relieve us from the apprehension that the potato is worn out, that it can be no longer depended upon as a healthy crop; and we should then know where to look for a remedy. Possibly this thrips revels at an earlier period in the potato blossoms, as it inhabits the flowers of the wall-flower, chrysanthemum, leucanthemum, &c. It has a natural enemy in the little shining brown larva of a bug.

Mr. Curtis saw one which had pierced the larva of the thrips, and ran about with it sticking upon its proboscis. (*Gard. Chron.* 1846, 564.)

Besides these the tubers of the potato are often seriously injured by the slug in wet soils, by a small centipede (*Geophilus electricus*), and by another polypod (*Polydesmus complanatus.*) The death's-head-hawk-moth (*Acherontia Atropos*), in its larva state, feeds upon its leaves, though without much injury. In America it is said to suffer much from two beetles (*Cantharis cinerea* and *vittata*), of the same genus with the blister beetle; and in the island of Barbadoes some hemipterous insect, supposed to be the *Tettigonia*, occasionally attacks them. In 1734 and 1735 vast swarms of them devoured every vegetable production of that island, particularly the potato; and this occasioned such a failure of this excellent esculent, especially in one parish, that a collection was made throughout the island for the relief of the poor, whose principal food it forms. (*Kirby and Spence's Entomology*, i. 116.)

Aphis rapæ (*vastator* of Smee) is sometimes found upon the potato leaves. It is not the cause of the lately prevailing gangrene, for this has generally occurred without the appearance of a single aphis.

H. WOOLDRIDGE, PRINTER, WINCHESTER.

THE

GARDENER'S MONTHLY VOLUME.

THE AURICULA;

ITS CULTURE AND HISTORY.

By GEORGE W. JOHNSON, Editor of the "Gardener's Almanack," &c.; and J. SLATER, Florist, Cheetham Hill, near Manchester.

THE ASPARAGUS;

ITS CULTURE AND HISTORY.

By the SAME, and ROBERT ERRINGTON, Gardener to Sir P. Egerton, Bart., at Oulton Park, near Tarporley, Cheshire.

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THE AURICULA.

THE ASPARAGUS.

THE AURICULA.

HISTORY.

There is no valid reason for believing that this beautiful flower—this "powdered beau" of our parterres—was cultivated by the ancients. The Roman legions traversed its native regions—the Alps—and it may have attracted, by its beauty or its fragrance, a transient notice, but we have no record of its being added to their pleasure-ground adornments. Indeed, they paid little attention to floriculture, and, if the Rose be excepted, we have but scanty notice even of any garden flower. Fabius Columna, it is true, thought that the Auricula is the *Alisma* or *Damasonium* of Dioscorides (l. iii. c. 169), and other classic naturalists, and that it is mentioned by Pliny (l. xxv. c. 10), but these are mere surmises, having no better foundation than that it would be as difficult to prove them erroneous as it is hopeless to shew that they are correct.

That the Auricula was but little known, even at the commencement of the 17th century, is demonstrated by the fact that neither Dodonæus nor Lyte mention it, though it is fully described by their contemporary, Gerard.

That it was previously known to continental botanists is certain, for Bauhin quotes authorities who had noticed it; and adds, that it was called Auricula Ursi, or Bear's-ear, from its leaves resembling that animal's ear. In his *Phytopinax*, published in 1569, he enumerates 12 sorts.

The Auricula is described and figured by Gerard in his Herbal, which appeared in 1597, and it is there called the Bear's-ear or Mountain Cowslip. He says there were then many sorts, giving drawings of eight, the yellow, the purple, the scarlet, the blush-coloured, and several reds. Like Bauhin, he gives them the specific botanical name of Auricula Ursi; but by Matthiolus and others it was named *Sanicula alpina*, from its supposed healing virtues and mountain birthplace. It was often called by ladies the French Cowslip.* Gesner named it *Lunaria anthritica* and *Paralytica alpina*. Parkinson says it obviously belonged to the Cowslip family, but Lugdwig was the first to arrange it there under the generic name of *Primula*.

* It is very certain that they were thus early much cultivated by French florists, for there is a poem in their praise, in a curious work published at Douay, in 1616, entitled "Jardin d'Hyver;" and with the verses are numerous drawings of the Auriculas, or "d'Oreilles d'Ours," as they are there called.

Gerard says that the eight kinds he enumerates were then commonly grown in the gardens about London, but it is evident they were not much esteemed; nor is any notice taken of raising varieties from seed.

This neglect soon passed away, for Johnson, in his edition of Gerard, published in 1633, says that there were then a very great many varieties of these flowers growing in the gardens of Mr. Tradescant and Mr. Tuggie. Tradescant's garden was at Lambeth, and he, at the time Johnson wrote, was gardener to Charles I. Tradescant was a Dutchman; and there is little room for doubting, that, bringing with him that knowledge of floriculture for which his countrymen were even then justly famed, he applied it to the improvement of the Auricula, which in Holland had been neglected. At all events, the attention then paid to this flower in England was as great even as at present. We had the credit then of supplying the Dutch florists with an endless variety of new sorts; whereas, latterly, we have been in the habit of receiving supplies of this plant every year from them, till the late war closed all communication between the two countries. (*Emmerton's Auricula,* 2.)

Parkinson, in his "Paradisus," published in 1656, says that "those who had been industrious in sowing the seeds of the several sorts" had so succeeded in raising varieties that he should not be able to enumerate them all. He describes, however, 21 varieties; and the drawing of one of these, "The greatest faire yellow Beare's Eares with eyes," shews that the florists had indeed much improved the flower; for, in the sketches given by Gerard and Lyte, the pips are small, and only four or five in a truss, but in this and others, given by Parkinson, the pips are large, and increased in number to from 8 to 13. Many other varieties, he adds, were to be found, with those that are curious conservers of these delights of nature, either naturally growing on mountains, or raised from seed, as is more probable; for several varieties have been observed to be gotten by sowing of the seed, every year lightly shewing a diversity, not observed before, either in the leaf or in the flowers.

The raising varieties from seed was then well known, but regular canons for distinguishing a good flower were not yet established, as they probably were when the "Complete Florilege" was published by John Rea, Gent.: in the third edition of which work, printed in 1702, there are many varieties noticed, and named after their raisers. (*Miller's Dict.*)

Mr. Hughes, in his "Flower Garden," published in 1672, gives a short direction for its cultivation, and is the first writer on gardening we have met with who speaks of it as the "Auricula."

The cultivation of this flower continued to increase in favour, and it is the first of our shew flowers that had published separate canons whereby the superiority of rival flowers might be determined. The work in which these appeared was written by Mr. James Thompson, a florist of Newcastle, and published at that town, in 1757, under the title of "The distinguishing properties of a fine Auricula."

These, however, were not the first; for that fertile writer on such subjects, Richard Bradley, in his "New Improvements of Gardening," published in 1718, gives seven characteristics of excellence which are "required by skilful florists" to be possessed by the Auricula. His directions for the culture of the flower, and his compost, are not so mistakenly rich and stimulating as was recommended by his successors.

In Lancashire, too, the cultivation of this flower was at that time sedulously pursued even by the weavers, for, from living witnesses, we have authentic evidence that the Auricula was cultivated at Middleton, and a few miles round, as early as the year 1720. James Fitton, of Middleton, began growing when he was from 14 to 15 years old; and at that time they were cultivated to some extent; and the growers of that period had devoted years to their improvement and cultivation; so, by adding 25 years to the time when he began, which was the year 1746, there is direct evidence that they have been cultivated at least 127 years. Fitton died at the good old age of 86 years, thirty years ago, and his son, who is yet an Auricula grower, is now upwards of 80, and he says from his infant years he was attached to them. Another Auricula grower, named Joseph Partington, of Tonge, adjoining Middleton, has been a grower 71 years, and is the oldest now living: he is a hale hearty old man of 86, and his delight is to talk of old times. When a boy, about 16 years old, he took the first prize at Eccles, about four miles from Manchester, with Taylor's Victory (Green-edged), for which he received 21*s.*; so that shews can clearly be proved to have existed above 70 years. In Partington's early years the principal growers were, Abel Buckley, of Tonge; John Buckley, of Chadderton; John Grime, sen. (the raiser of Privateer), of Royton, near Oldham; John Grime, jun., John Taylor, of Royton (the raiser of Taylor's Glory); James Mills, William Kenyon, of Middleton (raiser of Ringleader); and John Heyes, of Castleton Moor, near Rochdale (the raiser of Lovely Ann); and all within four miles of each other.

Taylor's Victory (green-edged), 1746, was considered the best out; and Partington says that there were as many varieties then grown as now. Redmayne's Metropolitan came out about 65 years ago, and was introduced by a florist named Tottle, and was generally said to have been a stolen plant. Heyes bought it, and sold it out as Heyes' Apollo;

and very shortly, when sold out into the south, the original name came, viz., Redmayne's Metropolitan. About 50 years ago this variety was sold as low as sixpence per plant, and was so plentiful that it was grown upon the borders in the open ground. Frames were but coming into use, and, previous to their introduction, the pots were, during winter, turned upon their sides, so that the wet could not injure the plant. A gentleman named Wrigley, of Langley Hall, was a grower in 1776, and he grew his plants in a kind of greenhouse, and open on the north side.

In 1776 the principal varieties were, Taylor's Victory (green-edged), Pott's Delegate (do.), Clough's Defiance (do.), Clough's Jingling Johnny (do.), Riding's Junius (grey-edged), Hughes' Pillar of Beauty (white-edged), Lee's Lord Lee (self), Ashworth's Man-of-War (grey-edged), and Pope's Gardener (self), considered at that period very fine.

The oldest auricula known was Rule Arbitrer (green-edged); and was generally grown in 1757. Pott's Eclipse (green-edged) in 1767. About 1785 Grime's Privateer was introduced, and shewn a long time as a green-edged flower; as were Slater's Cheshire Hero (green-edged), Popplewell's Conqueror (white-edged), Grime's Hyder Ali (green-edged), Wrigley's Northern Hero (green-edged), Walker's Goldfinch (yellow self), now known as Gorton's Goldfinch, Gorton's Champion (green-edged), Gorton's Stadtholder (yellow self).

The best proof of the rising public favour is, the fact that florists began to make it a prominent portion of their stocks. Thus we find its varieties enumerated in all their catalogues of the period; and Mr. James Justice, one of the best amateur collectors of his day, boasts, in his "Scots' Gardener's Director," published in 1754, that he had the largest collection of Auriculas in Europe.

Soon after, flourished Matthew Kenney, a gardener by profession, and who Mr. Hogg mentions as, perhaps, one of the most successful and eminent growers of Auriculas at that time, and won as many prizes as most men during the course of ten or twelve years when he lived at Totteridge, Middlesex. He certainly had all the benefit of air, situation, and soil, which, coupled with his fondness for the flower, and his skilful treatment of it, to say nothing of his being almost constantly in the garden, gave him a decided superiority over many of his competitors, and ensured, as it were, his chance of success. He always kept by him a quantity of sound stable loam, of rather a sandy nature; this he sweetened by frequent turning. His next principal ingredient was sheep-dung and hay litter, well rotted by being turned, mixed, and fermented in the same manner as the gardener does horse-dung and straw litter. This he never made use of under 12 or 18 months, when it had the appearance of leaf or fine vegetable mould; sometimes he put to it a small portion of cow-dung, but this very seldom; a little clean coarse sand was generally added. These formed his compost for growing this flower; but he had another of a richer quality, with which he used to top-dress his plants, and this he would do sometimes twice in the year. When he killed any sheep, he always reserved the blood, and mixed it with the dung of poultry. These two ingredients he added to his loam and sheep-dung, and these constituted his compost for surface-dressing. In fresh potting, every year he trimmed and shortened the fibres, and reduced the roots, with the mould adhering to them, to the bigness of a moderate-sized ball, but never shook the mould completely from the roots, if they were sound and going on well, until the third year; he then would wash the roots in water, examine them closely, shorten the tap or main root, and cut away any decayed or unsound parts; but if any plant appeared sickly at any time, he always served it in the same manner. He was particularly careful in making the holes at the bottom of the pots larger, and putting in three or four pieces of broken tile to drain the water off, and prevent it from becoming stagnant at the bottom of the pots: this, though apparently a trifling circumstance, ought always to be well attended to. The proportions he used were, one-third loam, two-thirds sheep-dung and hay-litter, and one-tenth coarse sand. (*Hogg's Auricula,* 124.)

In 1792 appeared James Maddock's "Florist's Directory," and in this is contained the first copious treatise on the culture of the Auricula with which we are acquainted. Maddock was a Quaker, originally bred a gardener at Warrington, in Lancashire, but, at the time he wrote, carrying on the business of a florist at Walworth. Mr. Hogg says that, it is well known to florists now living that Mr. Maddock neither excelled in the culture of the Auricula nor of the Carnation, but that he managed Tulips and Ranunculuses well.

As far as we have been able to make out from old records of Auricula shews, and from still older living authorities, the following appear to be the birth-times and names of varieties, some of which are still high in favour.

In 1802, the leading *Green-edged* varieties were Barlow's King, raised near Ashton-under-Lyne, and sold out by a person named Stretch, a very old Auricula grower, now dead, and called at that time Stretch and Barlow's King.

Lee's Colonel Taylor*	Pollitt's Highland Laddie
Whittaker's Rule All	Dean's Smoker

* Lee's Colonel Taylor, Lee's Talavera, Stretch's Alexander, and Staveley's Wellington, were raised by a florist named Staveley, who sold them when only a few plants: and when sold out were called by the names of the parties who bought them. He raised the four varieties from an old sort called Rone's Farmer.

Clegg's Black and Green	Rone's Farmer
Wild's Lord Bridport	Wild's Colonel Hanson
Thornicroft's Invincible	

Grey-edged.

Dean's Regulator	Butterworth's Lord Hood
Heyes' Lovely Ann	Harrison's William Pitt
Medcalf'sLancashireHero	Clegg's Lady of Honour
Ashworth's Man-of-War	

White-edged.

Hughes' Pillar of Beauty	Taylor's Incomparable
Lee's Bright Venus	Scholes' Maid of the Mill
Lee's Earl Grosvenor	Empress of Russia
Crompton's Admiral Gardiner	Dyson's Queen
	Foden's Fair Rosamond
Popplewell's Conqueror	Wild's Black and Clear

Selfs.

Grime's Flora's Flag	Nicholson's Bright Venus (yellow)
Gorton's Grand Turk	
Whittaker's True Blue	Redstart and Wild's Blue Chrystal.
Pope's Cardinal Fleury, called now only Cardinal	

It must be observed that many of the older varieties were still exhibited at this time, and were winners. From 1802 to 1820 the following new varieties were exhibited in addition :

Green-edged.

Buckley's Jolly Tar	Warris' General Blucher
Rider's Waterloo	Taylor's Ploughboy
Stretch's Alexander	Egerton's Lord Combermere
Hoffley's Lord Nelson	
Moore's Jubilee	Lee's Talavera
Booth's Freedom	Thornicroft's Invincible
Lord Lascelles	Clough's Dolittle
Pearson's Bajadoz	Partington's Trafalgar

Archer's Champion of England
Duke of Wellington
Glory of Bolton
Major Cartwright
Clegg's Sovereign
Commander-in-Chief
Pearson's Liberty
Faulkner's Manchester Hero
Pollitt's Woodland Laddie
Pearson's Beauty of England
Thompson's Revenge
Rider's Sovereign

Grey-edged.

Heyes' Lovely Ann
Cox's British Hero
Atcherley's Alpine Shepherdess
Ashworth's Rule All
Colonel Wortley
Dickinson's Matchless
Sir Sidney Smith
Kenyon's Surprise
Wild's Highland Lass
Thompson's Bang-up
Galloway's Glory of Oldham
Reform
Princess Elizabeth
Bright Phœbus
Potts' British Champion
Barlow's Morning Star
Harrison's William Pitt
Hill's Lady Stamford
Lee's Sir Wm. Wallace
Bishop of Manchester
Booth's Ranger
Earl Grey
Hope's Prince of Orange

White-edged.

Taylor's Glory
Scholes' Mrs. Clarke
Done's Rule All
Hughes' Liberty
Cox's Pillar of Beauty
Darlington's Lord Nelson
Brooks' Dreadnought
Lady Derby
Oddie's Queen Caroline
Mellor's Fair Lady
Williamson's Britannia

Selfs.

Bishop of Lichfield
Mellor's Lord Howe
Hopkin's Mine of Gold
Queen of May
Porter's King
Fair Helena
Carding's Forester
Ancient Lady
Comet
Pope's Lady Dartmouth
Squire Mundy
Parke's Black Joke

Beesley's New Metropolitan	Vett's King
Faulkner's Hannibal	Porter's Queen
Mount Pleasant	Doctor Syntax

Next in order of time came Thomas Hogg, formerly a schoolmaster at Paddington, but afterwards a florist at the same place. In 1812 he published a "Practical Treatise on the Carnation, Auricula, &c.," full of excellent directions for their culture, but it is equally well known of him, as he says it was of Maddock, that he excelled in the cultivation of other flowers (the Carnation, Pink, and Piccotee) more than in that of the Auricula. He says, in his "Supplement" to that treatise, published in 1833, that he aided James Emmerton in the writing and compilation of his "Plain Treatise on the Culture of the Auricula," first published in 1816.

Emmerton was a florist at Barnet, and an enthusiastic admirer of this flower; and, when he first patronised it, he says there were not more than a dozen persons near London who were favourably known as cultivators of the Auricula. He is the best authority we know on the management of this flower, excepting in the preparation of the compost for it. That which he recommends is, beyond all doubt, too rich and stimulating.

Mr. Hogg observes, upon this point, that the ingredients which Emmerton recommends, for the most part, are of a nature too filthy and offensive for general adoption, as well as too tedious in preparation, and very prejudicial, if used prematurely; but nothing could ever shake his belief in their excellence, power, and efficacy. Emmerton used to say, "My father used them, and I used them after him, and made improvements upon them, and nobody grew Auriculas better;" and it is but justice to add, that the Auriculas which the florists about Barnet, Totteridge, and Finchley, exhibited at that time—Kenney and Emmerton in particular—have not been surpassed, if equalled, by those of any florist of the present day; they were remarkable for their bold trusses, broad expanded pips of brilliant colours, strong stems, and large fleshy foliage—indisputable proofs of good culture. (*Hogg's Supplement,* 158.)

On this last remark made by Mr. Hogg, it is to be observed that it is doubtlessly true that, by the use of highly stimulating manures, it is quite possible to grow large and luxuriant Auriculas, but the plants will not bear such treatment more than two or three years. They then canker and die. Besides, it is quite as possible to grow them as fine in a less stimulating compost, and then they endure for many years. This was done by Matthew Kenney, instanced by Mr. Hogg as a successful cultivator; and it is now done annually by the weavers in and about Manchester.

The Auricula is, indeed, the poor man's flower; it is hardy, and takes up but little room, even when requiring shelter, so that it is suitable for petting by those who love floral beauties, yet are restricted in the means for gratifying the taste. Auricula shews are now to be found in many villages of almost every English county; and it is gratifying to be able to say, with truth, that the patient concentrated practice of the poor man usually distances, at these exhibitions, the more scienced efforts of the professional gardener. It is gratifying, because we would always have him the best cultivator who watches nature most closely. It is a wholesome lesson to us; and how successful have been the humble cultivators of this flower in the neighbourhood of Manchester, we have already noticed.

BOTANICAL CHARACTERS.

Primula Auricula—the garden Auricula, or Bear's-ear—belongs to the Pentandria Monogynia class and order of the Linnæan system, and to the Natural Order Primulaceæ.

Leaves, obovate, fleshy, succulent, with the edges mealy; the young leaves are entire, the adult ones serrate above the middle. Petioles leafy or winged. Leaflets of the involucre unequal, wide, lanceolate, or blunt. *Stalk,* many flowered, about the length of the leaves. *Flowers,* very sweet, four or five, in an upright umbel. Calyx, one-third of the length of the tube of the corolla, bell-shaped, toothed, mealy, as is also the scape. Tube of the corolla gradually widening upwards, not contracted at the neck; border concave, the segments emarginate but not deeply, and not cut to the neck. The most common colours are yellow or red, but it is found also purple and variegated, with a white eye, powdered with meal. *Capsule*, one-celled, spherical or nearly so, flatted a little at top, of a coriaceous-cartilagenous substance, sprinkled with meal; six-valved.

It is a native of the mountains of Switzerland, Austria, Styria, Carniola, Savoy, and Piedmont; also about Astracan. It flowers in April and May. In its wild state it is much less mealy than when cultivated.

We are not aware of any chemical analysis of this plant. It certainly has no active principle in its composition. The mealy powder, which so characterises this plant, seems of a resinous nature, and well calculated to repel excessive moisture.

VARIETIES.

THE varieties of the Auricula are divided into two groupes, *Selfs* and *Edged*, of which we will give separate and descriptive lists. *Alpines*, although really Auriculas, are not admitted as such by florists.

Under the directions for raising seedlings, we shall include suggestions for obtaining superior varieties; and will observe only here, that although many are produced every year, it takes some time before they get abroad. The florist who has been lucky enough to raise a fine flower is seldom inclined to part with any of it till he has been enabled to increase it to ten or a dozen plants, which are generally sold out at one appointed time; for, unless he can make something by it at the beginning, to remunerate him for his trouble, he will have little chance of doing it afterwards. Some plants throw out offsets freely, and are easily propagated, while others do it very slowly; so that it often takes four or five years of careful culture to raise even six plants of some kinds. This is the case with Lee's Colonel Taylor and Hedge's Britannia; added to which, plants of Colonel Taylor seldom survive the fifth or sixth year.

The following are lists of flowers at present cultivated, worthy of being in every large collection. Those marked with an asterisk are the best.

Painted, Variegated, or *Edged,* are those most highly prized, and have their colours divided into three clearly defined bands; the inner circle or *paste* round the eye being white, and the *tube* in the centre yellow; the middle band or *ground colour* some shade of violet, or dark purple, and the outer circle or *edge* either green, grey, or white.

They are classed, according to the colour of the edge, as follows:

GREEN-EDGED.

*Borth's Freedom
*Oliver's Lovely Ann, (shewn also in grey-edged)
*Page's Champion
*Stretch's Alexander
*Lee's Colonel Taylor
*Litton's Imperator
*Howard's Lord Nelson
*Ollier's Lady Anne Wilbraham
*Pollitt's Ruler of England
*Pollitt's Highland Laddie
*Pollitt's Standard of England
*Buckley's Jolly Tar
Warris' Blucher
*Barlow's King
Wood's Lord Lascelles
*Falkner's Ne Plus Ultra
*Pearson's Bajadoz
Wild's Lord Bridport
Hedges' Britannia (shewn also in grey)
Madder's Brilliant
*Hepworth's Robin Hood
*Moore's Jubilee
*Yates' Morris Green Hero
*Clough's Dolittle
Clapton Hero
*Lightbody's Star of Bethlehem
Cockup's Eclipse
Smith's Waterloo
Lee's Talavera
Simpson's Commander
Shakspeare
Gorton's Champion
*Ashton's Prince of Wales

GREY-EDGED.

*Grime's Privateer
*Waterhouse's Conqueror of Europe
*Kenyon's Ringleader
*Cheetham's Lancashire Hero
*Warris' Union
*Fletcher's Ne Plus Ultra
*Fletcher's Mary Ann
*Syke's Complete
*Taylor's Ploughboy
*Thompson's Revenge
*Kent's Queen Victoria
Lightbody's Conciliation
——— Candidate
Smith's General Bolivar
Page's Duchess of Oldenburg
*Ashworth's Newton Hero
*Thompson's Bang-up
Scholes' Mango
*Metcalf's Lancashire Hero
Rider's Junius

*Atcherley's Alpine Shepherdess
*Pearson's Liberty
*Howard's Sweepstakes
Hero of the Nile
*Rider's Waterloo
Wild's Highland Lass

WHITE-EDGED.

*Taylor's Glory
*Lee's Bright Venus
*Popplewell's Conqueror
*Ashworth's Regular
*Hughes' Pillar of Beauty
*Pott's Regulator
*Taylor's Favourite
*Wood's Delight
*Simpson's Lord of Hallamshire
*Ashworth's Rule All
*Cheetham's Countess of Wilton
Campbell's Robert Burns
*Kenyon's Lord Chancellor
*Taylor's Princess Royal
*Clegg's Crucifix
*Lee's Earl Grosvenor
Scholes' Mrs. Clark
—— Lancashire Lady
*Hepworth's True Briton
Wild's Bright Phœbus
*Hinchliffe's Lily of the Valley
*Mellor's Reform
*Lightbody's Fair Flora
*—— Fair Maid

SELFS

Are of one plain unshaded colour, with the paste round the tube white.

*Redmayn's Metropolitan
*Berry's Lord Primate
*Netherwood's Othello
*Grime's Flora's Flag
*Whittaker's True Blue
*Scholes' Ned Lud
*Findley's Purple of Tyre
*Kenyon's Freedom
Sim's Jessie
*Bradshaw's Tidy
*Oddie's Rest
*Hufton's Squire Mundy *alias* Faulkner's Hannibal
*Gorton's Grand Turk
*Gorton's Stadtholder (yellow)
*Gorton's Goldfinch (do.)
*Ray's Jupiter
Smiling Beauty
Ivanhoe
*Clegg's Blue Bonnet

ALPINES

Have the outer petals shaded by a mixture of two colours, not separated into distinct bands of colour, as in the edged varieties; and the paste round the tube is yellow instead of white, as in the edged and selfs.

Emmerson's Favourite	Kettleby's True Blue
Fieldhouse's Fair Rosamond	Margaret
King of the Alps	President
Queen Victoria	Victoria
Conspicua	Village Maid
Rising Sun	Miss Fieldhouse
Fair Helen	Captain Frazer

CHARACTERISTICS OF EXCELLENCE.

As florists have several terms relative to the Auricula which may be not understood by every amateur, we may as well here explain that the *thrum* is a collective name for the parts of fructification in the very centre or *tube* of each flower. *Paste* is the white colour next round the tube or *eye* of the flower. *Ground colour* is the next colour to this on the petal, being the distinctive colour of the variety. *Edge* is the outer colour of all, forming the border of the flower. A *Pip* is a single flower, and a *Truss* is several pips, with their several footstalks springing from one stem common to them all.

Upon the beauty of the form, and just association in the colours and proportions of the above parts of the Auricula's inflorescence, florists found their judgment as to either the excellence or inferiority of varieties, and of these the edged are universally considered the best. Mr. Emmerton was the first to have enlarged and correct opinions upon these points; others corrected where he had slightly erred, and the collective judgment of the floricultural world, with some judicious emendations by Mr. Glemny, were arranged and published by him as a code. With some slight additions it was as follows:—

The properties of the Auricula may be divided into two series; namely, those of the single pip, and those of the single plant.

The Pip.—1. Should be round, large, with petals firm, fleshy, smooth at the edges, without notch or serrature, and perfectly flat.

2. The centre or tube should not exceed one-fourth of the diameter of the pip; it should be of a fine yellow or lemon colour, perfectly round, well filled with the anthers or thrum, and the edge rise a trifle above the paste or eye.

3. The paste, or eye, should be perfectly circular, smooth, and a dense pure white,* without crack or blemish, forming a band not less than half the width of the tube, and encircling it.

* Yellow in the alpines.

4. The ground colour should be dense, whole, and form a perfect circle next the eye; the brighter, darker, or richer the colour, the better the flower; but if it be paler at the edges of the petals (where they are parted into five) or have two colours or shades, it is a fatal defect.

5. The margin or outward edge should be a clear unchangeable green, grey, or white, and be about the same width as the ground colour, which must in no part go through to the edge. From the edge of the paste to the outer edge of the flower should be as wide as from the centre of the tube to the outer edge of the paste.

In other words, the proportions of the flower may be described by drawing four circles round a given point at equal distances; the first circle forming the tube, the second the white eye, the third the ground colour, and the fourth the outer edge of the flower,* and the nearer they approximate to this (except that the ground colour, and green or grey edge, run into each other in feathery points) the better the flower.

* Maddock has recorded against himself that he had no correct eye for the beauty of proportions, for he gives as the standard of excellence (supposing the pip to be divided into six equal parts) one to the tube, three to the paste, and two for the ground and edge! The offensive glaring effect of these proportions are fully displayed in the illustration he gives at the end of his *Florist's Directory*.

The colours should not be liable to fly, as is the defect of Stretch's Alexander, the colours of which fade in 3 or 4 days.

Of the plant.—1. The stem should be strong, round, upright, elastic, bearing the truss upright without support, and from four to seven inches high, so as to carry the truss well above the leaves.

2. The length and strength of the footstalks of the pips should be so proportioned to the number and size of these that all the pips may have room to show themselves, and to form a close compact truss of flowers, not less than seven in number, without lapping over each other. The pips should be all alike in colour, size and form, so as not to be easily distinguished from one another, for otherwise the unity and harmony of the truss will be destroyed, and although ever so beautifully formed, would appear as if taken from different sorts of Auricula. An Auricula ought to blow freely, and expand all its pips at the same time, for by this means the colours in them all will appear equally fresh and lively ; whereas in those that do not blow some of the pips till others have passed their prime, the whole appearance of the truss is impaired.* (*Emmerton on the Auricula*, 16.)

* To remedy this defect, it is usual not to thin the pips too much soon after they appear, so that those which are so forward may be cut away, and the remaining pips will then bloom equally alike.

3. The truss is improved if one or more leaves grow, and stand up well behind the blooms, for it assists the truss, and adds much to the beauty of the blooms by forming a green background.

4. The foliage, or grass, should be healthy, well-grown, and almost cover the pot. (*Gard. and Florist*, i. 45.)

We are of opinion that all these criteria are founded upon the dictates of correct taste; but, as these excellencies are never combined in one variety, and as some, being equals in many qualities, are mutually superior in others, the question constantly arises at Auricula exhibitions, as to which variety has the preponderance of merit. Now, we are clearly of opinion that *form*, including in this the relative proportions of the colours on the pips, the length of the footstalks, the number of pips, &c., is by far the most striking excellence in an Auricula. Next to this we should place the harmony, or, as we should prefer, the agreeable contrast, or complemental association, of the colours. In our estimate of these, and other points of excellence, we agree with an authority, who has embodied his judgment as follows:—

Form, including the shape and proportion of the tube, of course takes the precedence, without reference to colour; for, let that be as it may, if the margin of the pips is undulated or frilled (a fault more particularly observable in selfs), or if the segments of each individual corolla are too wide, or should the flower have a disposition to cup, instead of lying flat and smooth, these are drawbacks which no brilliancy of colouring can counterbalance. Other defects under this head consist in the disposition which some flowers have to crack in the paste towards the tube, which is sometimes the case in Page's Champion; also when the tube is not perfectly round, and when the anthers or thrum do not fill its cavity, but appear as if they had discharged their pollen, and shrunk to half their size, as in Pearson's Badajoz. Again, injuries which the corolla or pip may have received from a chafe or bruise, also detract from form; and, in judging the merits of the respective flowers, this would be considered a serious defect, though by no means lowering the value of the plant, as this drawback is either caused by accident or the carelessness of the exhibitor.

Harmony, or the proper distribution of the colours. Judges, on taking into consideration the proportions of colour, will, of course, attach the greatest merit to those pips where the eye or paste, the dark or body-colour, and the edge of green, grey, or white, are distributed in the most equal proportions; that is to say, the nearer the distance between the tube and inner margin of the dark band approximates in width to the band itself, and the margin likewise, the better are the proportions.

Defects.—Under this head may be pointed out such flowers as Cockup's Eclipse, Howard's Nelson, and Taylor's Ploughboy, where the dark ground is too large in comparison with the other parts; or Pollitt's Standard of England, where it is often too small; and the Pillar of Beauty, in which the body-colour occasionally strikes through to the outer edge.

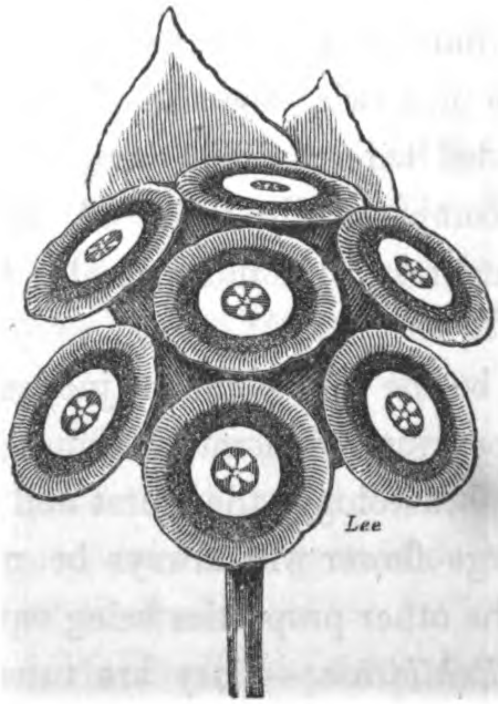
Colour, having depth or intensity, must always have the preference (other points being equal) to that of dull appearance. The purer the white, the darker the body-colour, and the more distinct the margin, the greater will be the merit of the flower; and the censors ought to bear in mind that these colours should be vividly and clearly portrayed. The agreeableness of the contrasts, or complemental association of the colours of the edge, the ground, and the paste, are also deserving of great consideration. A Lancashire flower, called Galloway's Glory of Oldham, has a foxy tinge between the eye and ground-colour, which is a serious defect. Stretch's Alexander is apt to become a pea-green on the margin, after being expanded a day or two, so that a truss of this variety will often have a very motley appearance. Sometimes flowers will be placed for judging with the pounce from the eye, or that of the margin, of grey or white varieties, smeared over the ground or body-colour: this fault cannot be overlooked.

Uniformity is the fourth requisite, for, whether the pips forming the head are small, medium, or large, they ought to be as near as possible equal in size, as in the accompanying woodcut, which shews a perfect

truss. Nothing looks more awkward than to have some of the pips twice the size of others, or to have some expanded three or four days, or a week, whilst others are comparatively buds. A fine contour (if we may so express it) is indispensable for a first-rate truss.

Size may be the fifth point for judges to consider. Generally speaking, moderately grown pips 'come' (in florists' phraseology) the truest and best; but, of course, a large flower will always be preferred to a small one, the other properties being equal.

Mode of Exhibition.—They are usually exhibited in the pots in which they have been bloomed. The strength of an unsupported stem, like that in the woodcut, as an evidence of good management, is, by this means, apparent, but cannot be appreciated when shewn in bottles, which is often done in the midland counties. Another desideratum (which, though absent, is not absolutely a defect) is, a single leaf immediately behind the truss: this gives it a neat and finished appearance, similar to the sprigs of green at the back of a bouquet. The number of pips necessary to form a head for competition varies much in different localities. In the north they are exhibited from three to nine; in London and the neighbourhood, seven are considered requisite. Not less than five, however, ought to be allowed (except in the case



of the first season of seedlings, when the minimum might be three), and as many more as can be symmetrically arranged, that have the required properties. Selfs, or Auriculas with only one colour besides the eye, are judged on the same principle as regards form, colour, uniformity, and size; with this exception, that as in some sorts the eye is small, in comparison with the blue, purple, or dark ground-colour, a slight variation is required, under the head of "harmony;" and the paste, or eye, ought to be one-half the width of the tube—larger in self-coloured Auriculas than in those which are edged. Alpines, or Auriculas with yellow centres and shaded margins, are judged by the same standard as above. They are not, however, often exhibited, or grown in collections, as it is next to impossible to save good seed where they are cultivated. (*Gard. Chron.* 1845, 256.)

In deciding on the relative merits of flowers, it is a good plan to give to form, including rotundity and flatness of the corolla, &c., five points; to harmony, or a just distribution of colour, four points; to intensity (including just association) of colouring, three points; to uniformity, or proportions of the truss, two points: and to size, one point. Suppose, by way of illustration, that the two heads of competing flowers are trusses of Lee's Colonel Taylor, green edge; No. 1, with seven pips, from rather a weakly plant; No. 2, with five, rather larger. In form and colour, suppose they are acknowledged to be equal; but No. 1 has two of the pips in which the ground or dark colour has struck through to the outer edge, still it is most uniform. There would then, in this case, be only three properties to decide on: distribution of colour or harmony, uniformity, and size; and the decision would stand thus:—

No. 1.—	Form . . .	equal
	Harmony . .	
	Intensity . .	equal
	Uniformity . .	3
	Size . . .	
		3

No. 2.—	Form . . .	equal
	Harmony . .	4
	Intensity . .	equal
	Uniformity . .	
	Size . . .	1
		5

No. 2 would thus be awarded the first place, winning by two points.

Again, of Colonel Taylor, *v.* Galloway's Glory of Oldham:—

The former would be best in—

Form . . .	5
Distribution . .	4
Colour . . .	3
	12

The latter best in—

Uniformity	2
Size	1
	3

Again, we will suppose other two flowers. No 1, best in form and colour; which would be 5 and 3=8. No. 2, best in distribution, uniformity, and size; which would reckon 4, 2, 1=7. No. 2 would thus lose by one point.

Another example will be sufficient to show the working of this method. No. 1, best harmony or distribution, and most intense in colour, would be 4 and 3=7. No. 2, best form, uniformity of truss and size, 5, 2, 1=8. No. 2 winning by one point. (*Ibid.* 272.)

EXHIBITING.

In different localities various systems of exhibiting the Auricula are in practice. In the south it is usual to shew in pairs—a green and grey, or white edge, for instance. In other parts of the country, pairs of four, consisting of the above varieties, with a self-coloured one added, are brought in competition: to those, some societies add an Alpine. Others, again, shew entirely in classes, the flowers being placed first, second, third, &c., according to their respective merits in each colour. These various systems of exhibiting are of course mere matters of taste or convenie nce.

If exhibited in Paris, the following additional desiderata should be kept in remembrance by the judges.

Of the Pair.—1. The pair should be of equal height and size, both in truss and foliage. 2. The colours of the flowers should be as much contrasted as possible, a green edge and a grey one, a dark ground and a bright one, a dark green edge and a light green edge, or any other contrast in the colour, would be a point over equally good flowers not so contrasted. (*Gard. and Flor.* i. 45.)

MODES OF PROPAGATION.

We once saw an emission of roots from the lower end of an Auricula leaf which justifies the opinion that, like most fleshy-leaved plants, it might be increased by that means, but we have never tested this experimentally.* The only mode of propagating established varieties of the Auricula, practised by florists, is by slips from, and divisions, of their roots. New varieties are raised from seed.

By slips and root-division.—The best time for thus propagating the Auricula is during the last half of February, though it is quite true, as stated by

* A florist near Middleton, raised a plant of Lees Col. Taylor by this means, which has bred and bloomed the same as any other plant of the same variety.

Emmerton, that it may be done at any time from February to August. Hogg, when he first wrote on the Auricula, was in favour of planting slips in August, but, in his "Supplement," published thirteen years subsequently, he recommends all offsets to be removed from the parent plants in March, because they grow quickest in spring. This season is now almost universally adopted for propagating by slips, and the course of proceeding has been thus succinctly stated by Mr. Groom, florist, of Clapham:

The best time for propagating is the month of February, taking the offsets and potting them (if strong), one in a three-inch pot, or, if small, four or five in the same sized pot; the most suitable soil is a mixture of one half loam, laid up for three years, one fourth top spit of a rich meadow, and one fourth rotten dung, five years old. The situation should be south or south-east, on a dry bottom, and the plants set near the glass, shaded from the sun when powerful, as they get forward for bloom. (*Gard. Journ.* 1846, 200.)

For the following more copious directions we are indebted to Mr. Emmerton:—

The slips are often so situated that, by removing a little of the earth, they may be taken from the mother-plant with the finger and thumb, or with a sharp piece of wood, made for that purpose in the shape of a knife, without taking the plant out of the pot; this will do the plant little or no injury, and should be done, if practicable. When the suckers are large, and so united to the mother-plant that it is difficult to separate them and yet to preserve a sufficient quantity of small roots to them; take the plant out of the pot, and divide the main root, with a sharp knife, into as many parts as there are suckers. This operation, likewise, is the safest for two reasons; first, because the suckers, being difficult to be severed, will not by that means be so much in danger of spoiling; and secondly, being thus separated they will certainly bring away more small roots with them than if they were torn off. Sometimes the operation of the knife is not necessary, and yet the offsets cannot be so well separated without taking the old plant out of the pot; when this happens, and you have slipt off the offsets, trim the fibres of the old plant, and replace it again into its pot; if this can be done without disturbing many of the roots, the old plant may blow the stronger for it. If there is not above an offset or two, and you want a strong bloom from the mother-plant, take them off without removing the old plant; if this be not practicable, let it remain till the plant has done blowing; it will then be time enough to remove the offsets. Plant the offsets, immediately on taking them off, on the side of pots called (about London) upright forty-eights; they are about four or five inches over at the top, three inches and a half at the bottom, and four or five inches deep, so that the plants may easily slip out, with all the earth round them. When the offsets have been thus planted, trim the fibres of the mother-plant, and replace it again in its pot, adding a little fresh earth to supply the place of that which is removed in trimming the fibres. Give the plants and offsets a gentle watering and place them in the shade (the warmer the weather, the more shade and water they require.) Be careful not to place them under trees; the water that drops from them, both in showers of rain and afterwards, is very pernicious to all kinds of plants and flowers; the plants thus managed, will be strongly rooted before winter. (*Emmerton's Auricula*, 127.)

By Seed.—By this mode new varieties are obtained, and by very careful attention to the selection of the parents, and that no impregnation takes place from undesired plants, very considerable control may be exercised over the qualities obtained to the progeny. This control, however, is very far from being absolute, for grey-edged seedlings will come from green-edged parents, and far more of selfs than any particoloured flowers. For this reason Mr. Emmerton is quite right in recommending Auricula fanciers to endeavour to save seed annually sufficient to raise about 400 seedlings, out of which they might succeed in bringing 300 to the condition of healthy blooming plants. From 20 to 24 young plants will produce, usually, a sufficient quantity of seed, on an average of seven years, to raise annually the quantity named; but if a heavy crop of seed is obtained, which will be the case some seasons, that number of plants may produce a sufficient quantity of good seed to raise 600 or 700 seedlings; and, if so, about 450 seedlings will arrive to blooming perfection. Out of 300 seedlings saved on this system, you are at a certainty of raising five superior or first-rate flowers, besides seven or eight (if not more) second-rate flowers. No one should raise seedlings from any sort that cracks in the eye, even if the colours be ever so brilliant, and its other properties perfect. (*Emmerton's Auricula*, 23.)

Make choice of such plants to save seed from as are not more than two or three years old, and healthy; for, though such plants usually bear but small trusses, their seed pods are as generally large and full. The best proportioned and highest coloured flowers should be saved, and their colours should be true and unchanged to the last; or, as florists term it, they should "die well." Most flowers having a ground colour of a dark blue purple die bad, whilst those of a dark red purple commonly die well. Plants with only one stem or truss are to be preferred. All ordinary flowers should be removed to a great distance from those intended for seed, to prevent cross impregnation from them. (*Ibid.* 17; *Hogg*, 148.)

Move the breeders early from any winter shelter they may have had, and let them be placed in an open situation, yet shaded from all but the morning sun.

They should be preserved from excessive rain by mats on hoops, or small hand-glasses may be placed over them. In dry weather, let them be regularly watered, either by sprinkling from a brush, or otherwise with a fine rose, as often as they appear to require it. Much depends on a due attention to this particular point. (*Maddock's Florist's Directory,* 127.)

The best time for setting apart the breeding plants is during the two middle weeks of March. Place the breeders in an east aspect (by no means a north as yet), and there leave them to grow and bloom in their natural way. At all events, never suffer flowers intended for seed to remain longer in their winter quarters than when they begin to expand their master pips, and never allow them to remain in the frame till they have completely blown. Flowers that are permitted to bloom, and remain under glass any length of time, or that are placed on a stage, will seldom produce bold strong seed. Large strong plants, that are bloomed very fine under glass, and afterwards are placed on a stage, seldom or never have a perfect, sound seed; the pods will apparently thrive, and swell to a large size, but when you open them in the sowing season the seed turns out to be delicate, thin, and weak. Cut out the centre weak pips early, which strengthens the other pips, and promotes the production of seed. So soon as the petals have faded remove any that may still cling round the seed vessels, for they retain moisture, often injuring them, and checking the ripening of the seed. (*Emmerton*, 44; *Hogg*, 139.)

The seed will ripen in July, and the ripeness is known by the pods turning brown, and beginning to open. Look over the plants daily, and gather the pods as they ripen, lest the seed be shaken out by the wind or other accident. The whole truss will not ripen together, therefore cut off each pod as it grows ripe, put it in a thin white paper bag, and place it in a window in the sun for two or three days to harden, and prevent its growing mouldy. The seed should be kept in the pods as much as possible till the time of sowing. (*Emmerton*, 46.)

Best Varieties to Breed from.—There are no class of seedling florist's flowers that sport so much as Auriculas, and to ascertain the cause of this has often puzzled the most experienced growers. Lee's Col. Taylor almost invariably "brings," or produces, Selfs, and others a considerable portion of them Alpines. Few growers have ever been able to raise more than three or four varieties in their lifetime; and Emmerton, Maddock, &c., never raised one that was able to retain a place in a collection. We knew two Auricula growers, of 50 years' standing, who were annually sowing seed, and yet never raised a good variety, although in other florist's flowers they were successful. In our opinion, this has been owing to taking seed from the very old varieties, which have been only a slight improvement upon the earlier ones ; and to be successful, no doubt the more modern the varieties from which the seed is taken, the greater probability of success. We have had a long and interesting conversation upon the subject with a very old grower, and, without any previous communication with each other, we scarcely differed at all on this point. After a careful consideration of their properties, &c., we have selected the following as the best for breeders :—

GREEN-EDGED.

Litton's Imperator
Barlow's King
Yates' Morris Green Hero
Pollitt's Highland Laddie

WHITE-EDGED.

Simpson's Lord of Hallamshire
Taylor's Favourite
Taylor's Glory
Cheetham's Countess of Wilton

GREY-EDGED.

Kenyon's Ringleader
Fletcher's Ne Plus Ultra
Waterhouse's Conqueror of Europe
Fletcher's Mary Ann
Syke's Complete
Cheetham's Lancashire Hero

SELFS.

Whittaker's True Blue
Netherwood's Othello

Cross impregnation might be effected, probably, by cutting off the anthers immediately a pip opens, and applying the pollen to the pistil by the aid of a camel's-hair brush. A very fine-pointed pair of scissars must be employed, and great care in removing the anthers.

The breeders should be placed in a frame made for the purpose, and having lights to fit it like a cucumber frame. The sides should be a foot and a half broad and one inch thick, and small cross-bars should be fitted within in the form of those for a window-sash. These cross-bars are to support a covering of the finest net, such as is employed for making ladies' caps, which must be nailed tightly over, so as to exclude even a small fly, and thus you will prevent accidental impregnation.

Sowing.—If autumn sowing be adopted, we recommend the seed to be sown soon after it is ripe, not later than September. But if, as directed by Hogg and Emmerton, the seed is kept out of the ground until January or February, let it be preserved in the seed vessels, and kept in a cool, not very dry, room. If sowing immediately the seed is ripe be the mode adopted, the system recommended by Mr. P. Cornfield, florist, of Northampton, may be advantageously pursued:—

When the seed is ripe, he prepares the soil to receive it in the following manner:—Sift the soil, which is chiefly of bog and old rotten cowdung; then sprinkle it, to make it quite moist; then put some of it into a shallow tin pan, and place it over a clear fire, till it is as hot as can be borne by the hand. Keep stirring it till it has destroyed any seeds of weeds, or the larvæ of insects; preparing soil enough to lay it about three or four inches deep from the upper edge or rim of the pots. Then gather the seed-pods, rub the seeds out on a sheet of paper, sow them immediately; and sift through a very fine sieve just enough of soil to cover the seed, about as thick as a sixpence. Place the pots in a shady situation, or where they can only have the morning sun for an hour or two. Use no frame or glass of any sort till after Christmas, as they will generally bear a good deal of cold till that time. Sow as thick as nearly to cover the surface of the soil. The seedlings will come up plentifully in three weeks or a month, and great numbers of them will be fit to prick out in November or December; being careful to extract them so as not to disturb the lesser plants. The seed will continue to come up for months after. Although seed a year old will vegetate, yet new seeds make the strongest and most healthy plants. (*Gard. Mag.* vi. 426.)

The time of sowing and treatment of the seedlings recommended by Mr. Emmerton, Mr. Hogg, and Mr. Maddocks, are good, and, our object being to concentrate information, we subjoin their respective recommendations, appending our own observations and counter experience on a few points. Mr. Emmerton says—

Sow in small pots, about six inches over the top, and about six inches deep, or, what are termed by the potters about London, flat-thirty-twos; the hole at the bottom of the pot should be made larger than usual; after which it should be covered with a hollow oyster-shell, or a piece of tile made to lie hollow, or a piece or two of garden-pot, which will drain off the water from the pots. The pots should be filled about two inches and a half with coal-ashes, or small cinders, about the size of coarse gravel, which will greatly assist in draining off the water, and at the same time prevent the worms getting into the pots, and disturbing or injuring the seedling plants. Fill the pots with the same kind of compost, sifted finely, that was used for the blooming plants, within about half an inch of the top; shake the pot well, to settle the mould, then smooth the earth, and let it be tolerably well pressed with the bottom of an empty pot, or something flat that will fit the top of the pot, then sow the seed very equally, taking care that the wind does not blow any part of it; have some of the earth very finely sifted, and not too dry, which cover over with your hand very regularly, to rather better than the thickness of a shilling, giving it another gentle pressing with the pot, &c., and make the surface quite level. Place the pots in a situation quite excluded from the sun, except in the morning, placing closely over it a crown glass shade, or what is called a striking glass, so as to fit the inside of the pot; this will cause the seed to vegetate much sooner; and by pouring the water upon the top of the glass, the earth will receive sufficient moisture, so that there will be no occasion to remove it. The front of a greenhouse, or a cool frame, are good places for the seed-pots to be placed in, but by no means a hotbed; or, if not that accommodation, a hand-glass, having tiles or slates placed underneath, to keep the worms out of the pots; great care being taken to keep the earth in a regular moist state. In about four or five weeks—perhaps three weeks—if in a greenhouse, the seeds will break ground; and when the leaf begins to appear, take care, by degrees, to admit air, first by raising the glass a little on one side by a small piece of wood or tile, which can easily be removed when it is found necessary to give the plants water, which should still be done by pouring it over the glass, by which means no risk is incurred of washing up the plants, and every part of the earth will get a sufficient degree of moisture, after which air can again be admitted; and, as the plants advance in size, more air can be given by raising the glass quite level all round, and as they get strength let it be raised higher by degrees; and when they appear with four leaves, it may be entirely removed.

You must then let the plants be exposed to gentle, but by no means to very heavy rains; take care to keep them clear of weeds, and the sooner you do this the better, before the Auricula roots spread so as to be liable to be disturbed by weeding. A very little attention will serve to distinguish the young weeds from the seedling plants. When the seedling plants are young, consequently tender, they should be kept entirely from the sun; for when they first appear, an hour's strong sun would destroy the crop; nor should they have the sun during the summer months, after ten or eleven o'clock, even if they are growing strong. The Auricula delights in cool shade, under a north wall or pales, &c., but by no means under the droppings of trees, and in the winter season only requires the comfortable and invigorating heat of the sun. As soon as the plants appear with six leaves, they should be carefully pricked out, into pots about five inches over, or what are called about London, forty-eights, filled with the same sort of compost they were sown in, about four or five in a pot. Early in the spring following they should be again removed; the best time is the 1st to the 12th of March; put them singly into small pots, or what are called upright sixties (and there to remain for bloom), which will be of a sufficient size to carry them through the summer, particularly the strong platns; those that are very weak, keep two or three in a forty-eight pot till another season, as they may bot bloom till the third year. (*Emmerton*, 50.)

Mr. Hogg's directions are these :—

Let the seed be sown in pots adapted to the size of your striking or bell-glasses, no matter whether in 32 or 24 sized pots, which are to be filled one inch and a half deep at the bottom with broken oyster-shells, tiles, or small cinders, to ensure a good drainage; then fill the pots with finely-sifted compost, and smooth the top of it with a flat smooth board, made round to fit the inside of the pot; let the compost be fullest in the middle, gradually falling to the sides of the pot. Then sow the seed as regularly as you possibly can, and cover it, as nearly as you can guess, with fine mould passed through a sieve to the thickness of a shilling; take a clothes or other soft brush and dip it into soft water, giving it a shake to throw off the heavy weight of the water, then either shake it over the seed, or draw your hand along the hair, and it will fall like a dew upon it; repeat this till you perceive the compost to be well moistened. By watering in this manner you will not be liable to disturb or wash out the seed. You may then put on the bell-glasses, or if you have not these, you may cover the seed with squares of window-glass, resting on the tops of the pots, which, in the opinion of many, answer full as well, if not better. Place the pots in pans or saucers in the front of a greenhouse, or the window of a dwelling-house close to the glass, where they will have the benefit of the sun, and keep the saucers well supplied with water, so as to render top watering less frequent and necessary. If you perceive at any time a little mouldiness on the surface of the mould arising from the confined damp, take off the glasses for a day, and let them be wiped dry before you replace them. The seedlings will make their appearance in a month, but sometimes not in less than six weeks. When the seed is up, take away the striking glasses, and place squares of window glass over the pots in their stead, for you must be careful not to confine the seedlings too long, and so draw them up weak, as you would mustard and cress. Give air gradually, and harden them to it by degrees. The young plants, when beginning to sprout, will sometimes throw their roots out of ground, which must be carefully put in again, by making a small cleft in the earth, and closing the soil round them; this may be done with a long flat bit of ivory or smooth wood, thin at the end, and about one-eighth of an inch broad. As soon as the plants are fit to handle, transplant them carefully into store pans or pots, an inch apart, filled with proper compost, which ought to be raised in a convex form, one inch and a half higher in the middle than at the sides; water with the brush as before, and place the flat window-glass over the tops of the pots, for a week or two longer, shading them from the sun in the middle of the day. Water as often as you see occasion. If your plants thrive and do well, in a month or five weeks more you may transplant them a second time into fresh compost, which will very much encourage their growth, where they may remain till August, when you may plant them singly in 60-cast pots, or put three round the edge of a 48, for next spring bloom. Do not overcharge the saucers with water; the mould, if over watered on the top, while the bottoms of the pots are standing in the water, imbibes too much moisture; and the seed will often not only rot, but the young plants will be liable to damp off also. The seed never vegetates freely in very wet mould; yet it should be kept moderately moist. The other sowing may be made towards the middle of February, or the beginning of March; which, being less liable to be checked by frost and cold, will often produce a better crop, and be attended with less trouble than the former; though it would be too much to expect, that any of the plants, raised at this later period, will flower the following spring; the seed may be sown in pots, with glasses to fit inside of the rim, or in open pans, which may be placed in a frame filled with tan; for a very little moderate heat, to keep up the temperature by night, for two or three weeks, will make the seed vegetate sooner; if the weather should prove mild, with occasional sunshine, you may expect to see the seed break ground early in April. (*Hogg's Supplement,* 172.)

Mr. Maddock says :—

The seed should remain in the pericarpium, or seed-vessel, in a dry room, till sown in January or February. A hotbed, with frames and glass lights, similar to those made use of for cucumbers and melons, being in readiness, provide a box, or boxes, about five or six inches deep, fill them with compost, and gently shake or strike them against the ground, till the earth settles a little; make the surface perfectly smooth, and sow the seed with the utmost regularity; then sift upon it, through a fine wired sieve, a little compost, or decayed willow mould, sufficient only just to cover the seed, and place the box in the frame on the surface of the hotbed; the glasses must be placed over it, and so managed as to preserve a moderate and equal degree of warmth, both day and night, but the glasses must be occasionally opened, or raised at the higher end, to admit fresh air, and to suffer the exhalations from the bed to escape, which is a very essential point. The superior advantage this has over the common methods of raising the seed, is, that it forces every live grain into vegetation in about three weeks, if the warmth of the bed is properly kept up; whereas, by the more usual mode of exposure to the open air, the greater part does not vegetate till the second year; and the weaker seeds, which are probably the most valuable, seldom vegetate at all. The earth and seed must always be kept moderately moist, but never very wet; the best method of watering it, is by means of a hard clothes-brush, dipped into soft water, which has had its chill taken off by standing in the sun; the hair side being quickly turned upwards, and the hand rubbed briskly over it, will cause the water to fly off in an opposite direction, in particles almost as fine as dew; a sufficient watering may in this manner be given in a few minutes.* If it is found impossible to preserve the heat of the first bed till the seed has all vegetated, it will be proper to remove the box to a second, prepared in the same manner, which will infallibly answer the purpose with proper management: if the surface of the earth in the box is inclining to become mossy or mouldy, it must be stirred all over very carefully with a pin, about as deep as the thickness of a shilling. At the expiration of three, four, or, at most, five weeks, the young plants will all make their appearance; it then becomes necessary to give them, very gradually, more air; in

* It is a good plan to put some fresh clean moss over the seed when sown; this keeps the surface more equally moist, and insures its rapid and certain germination. This moss must be removed as soon as the seedlings are fairly above ground, for as they do not by any means require heat, so are they rather impatient of moisture. (*Gard. Chron.* 1846, 272.)

order to harden and render them fit for an entire exposure to it, which they will be able to bear in a fortnight or three week afterwards; at which time the box should be taken out of the frame, and placed in rather a warm situation, though not too much exposed to the sun, till towards the end of April, when it may again be removed to a cooler aspect, where it can only receive the sun till nine o'clock in the morning; and in May, if the weather is hot, it should be placed in the most cool and airy part of the garden, not neglecting at any time to keep the earth moderately moist; but at the same time preserving it from violent rains, whenever they occur. As soon as the plants appear with six leaves, such should be taken out from the rest, and transplanted into other boxes, filled with the compest, about an inch and a half, or two inches asunder; and when they they are again grown, so as nearly to touch each other, they may be again transplanted into larger boxes, or round small pots, at the distance of three or four inches, where they should remain till they blow, which will generally happen the following spring, perhaps before they have acquired any considerable size; and then such as appear to be possessed of merit should be marked, and the inferior ones destroyed. As soon as the bloom is over, such as have been marked should be taken up, and planted separately in small pots, and be taken the same care of as a full grown Auricula, till they blow again; at which time their respective merits and properties may be ascertained with more accuracy. Such weakly plants as are not able to blow the first or second year, ought, nevertheless, to be carefully preserved; for amongst these, it often happens that the most valuable flowers are found. *(Maddock's Florists' Direc.* 128).

Having given the directions of the principal writers upon the Auricula, it is necessary to point out what we consider to be their defects. There are few advocates for autumnal sowings of seed, as it makes but little progress before the winter sets in, and there is a great risk of the seedlings being cut off. Another palpable error in the systems of the cultivators just quoted is the watering over the foliage of the Auricula seedlings, for more losses arise from this cause than any other. The primitive plan adopted by the most celebrated cultivators in the north is far better adapted to the purpose. They generally take a tea-pot, and water around the edges of the pots, without even wetting the foliage, both in seedlings and blooming plants. The potting of seedlings into small pots, as mentioned by Emmerton and others, is another very great mistake. We never knew an Auricula grower of any note who either potted his offsets or his seedlings into small pots, but principally into large ones, some even more than a foot in diameter, and around the edges of the pot. By so doing the quantity of soil which the pot holds keeps much longer moist, and consequently much trouble is avoided in watering; and another advantage gained is, that the plants grow so much quicker, and soon become blooming plants, when they are planted in pots of the same size as these, and are treated similarly.

SOIL AND MANURES.

THE greatest error into which the cultivators of the Auricula wandered some thirty years ago was the employment for its growth of highly stimulating manures and composts. No treatment could be more repugnant to its natural habits, and the usual results of over-excitement were the consequence—too much luxuriance of foliage—deficiency and uncertainty of bloom—canker and, its speedy consequence, death. So precarious did the successful culture of the Auricula become under such treatment, that it was gradually being neglected, until Mr. Hogg, Dr. Horner, and others, restored to it the attention it deserved, by adopting a more natural soil and nourishment, and thereby rendering it a more certain reward for the florist's care.

The compost in most general use among Auricula growers is, fresh loamy soil, and perfectly decomposed cow-dung, equal parts of each, adding one-tenth of sea or river sand. Some use leaf-mould instead of cow-dung. The whole incorporated and prepared for one summer and one winter, before required for potting, in the usual manner.

The finest Auriculas we ever saw were potted in equal parts of good turfy loam, leaf-mould, cow-dung, and sand, and frequently watered with manure-water from cow-dung.

Dr. Horner, who was one of our best modern cultivators of the Auricula, used a compost of two parts pasture sods, two years old; one part cow-dung, three years old; and half a part coarse river-sand, with the use of decayed leaves, as will be explained in potting. Good, rich, loamy soil, from an old pasture, and old frame dung, will be good substitutes for sods and cow manure, and should be used in the same proportions. All hot, stimulating manures must be carefully avoided. (*Gard. Chron.* 1841, 397.)

Mr. Dickson, well known in the neighbourhood of London as a successful grower of the Auricula, uses a soil composed of one-third Norwood loam, one-third peat and leaf-mould in equal quantities, and one-third rotten dung. (*Gard. Chron.* 1842, 283.)

The father of Mr. Slater, one of the editors of this volume, some 22 years ago, grew about 200 pots for his own amusement, and he invarirbly used decayed horse-dung, maiden soil, in equal proportions, to which he added some coarse river sand; and this succeeded very well. An Auricula grower at Prestwich, a few miles from Manchester, who, at the time of his death, had been a cultivator of this flower for nearly 60 years, with very remarkable success, employed a compost thus constituted:—1 peck of rushes (green) cut into small pieces not longer than 1 inch; 1 ditto cow-dung and 2 ditto horse-dung, not fresh, but old; 1 ditto meadow soil; ½ peck of bog or peat earth; ½ ditto coarse sand; mixed at least three months before used. That rushes, cut small and mixed with all composts, is generally admitted to be good by the practice of using them so general in Lancashire. They appear to be beneficial from two causes, viz., they keep the compost light, so that the air can penetrate it, and they facilitate the drainage. It is highly probable, also, that the rush may contain saline matters that are peculiarly acceptable to the Auricula. Rushes have a large amount of such saline constituents, and some of them are quite peculiar, such as the salts formed with equisetic acid, in the common horse-tail of our rivers (*Equisetum fluviatile*). But besides these, there are in all rushes several salts of potash and lime.

Either of the foregoing, but especially Dr. Horner's compost, we consider admirably suited to the growth of the Auricula, but as our object is to concentrate in these pages all the knowledge we can obtain upon each subject, we subjoin a detail of the composts used by the three florists who wrote upon the culture about a quarter of a century now passed. We warn our readers that all these composts are too stimulating,—Mr. Maddock's the least so, and Mr. Emmerton's being the most objectionable.

The compost recommended by Mr. Maddock consists of the following ingredients:—1-half rotten cow-dung, two years old; 1-6th fresh sound earth, of an open texture; 1-8th earth of rotten leaves; 1-12th coarse sea or river sand; 1-24th soft decayed willow-wood; 1-24th peaty or moory earth; 1-24th ashes of burnt vegetables. In order to procure the last article with very little trouble, any weeds, sticks, straw, or old mats, that are of no other value, may be collected together in a heap, and consumed by fire in the open air, till their ashes become white; they will contain a small portion of alkaline salts, and should be spread upon the surface of the other ingredients. The compost is to be placed in an open situation, perfectly exposed to the action of both air and sun, from the influence of which it will derive great benefit: it should be turned over once or twice, and as often pass through a coarse screen, or sieve, that it may be well mixed and incorporated; it should then be laid in a regular heap, or mass, from 15 to 18 inches thick, but not more; in this state it may remain a year before it is made use of, during which period it will be proper to turn it over two or three times, in order to expose all its parts to the atmosphere. Composts should always be kept free from weeds. (*Maddock's Flor. Direct.* 93.)

The compost generally employed, and mostly made use of by Mr. Hogg, was, 1-3rd fresh yellow loam, or maiden mould; 1-3rd cow-dung, well rotten; 1-3rd night-soil, two years old; 1-3rd leaf-mould; 1-10th sea or river sand; to be well prepared and incorporated. Auriculas, he says, grow very well in this mixture, but adds, that they should be top-dressed about six weeks before they come into bloom with a compost of a stronger and more active manure. Emmerton's compost of goose-dung and blood, night-soil, loam, and sugar-baker's scum, of each one-third, is well calculated for top-dressing in February. Whoever grows Auriculas in low situations will, perhaps, do well to use old frame-dung instead of cow-dung, because it dries sooner than cow-dung, which is better calculated for elevated situations. The circulation of air is always brisker on the hills than in vales; and, besides, Mr. Hogg attributed the rot, which in most summers and autumns very frequently attacks the Auricula, to too great a portion of cow-dung in the compost. Where a large stud of Auriculas (to use a Yorkshire term) is kept, it seldom happens that the same sort of compost, precisely, is made use of two years together; this was very often Mr. Hogg's case; he frequently, as opportunities occurred, deposited in the same heap, sheep, horses, cows, poultry, pigeons, night-soil, and blood from the slaughter-house, and turning and mixing the whole up together. He recommends the following compost for strong blooming plants, and says it will retain its virtue for a length of time:—1 barrow of sound staple loam, 1 ditto dried night-soil, 1 ditto dung of sheep, cows, and poultry, mixed in blood from the slaughter-house, in equal quantities, ¼ ditto sea or river sand; which will be fit for use in no case under two years. (*Hogg's Auricula*, 127.)

Mr. Emmerton's chief compost, for he multiplied them most needlessly, and made them all far too rich, is as follows:—3 barrowsful of goose-dung, steeped in bullock's-blood, 3 ditto sugar-baker's scum, 2 ditto fine yellow loam.

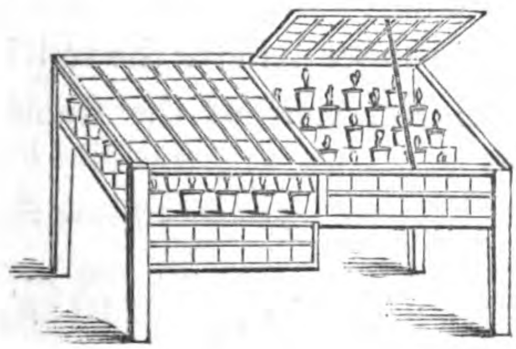
If, says Mr. Emmerton, your mould contains any grubs, insects, or worms, add a peck of quicklime; that made from stone lime is preferable, as it contains less of magnesia; lime not only will destroy them, but will hasten putefraction, and make the compost sooner fit for use; and if you wish to force the compost still more, spread it about four inches thick in the hot months of June, July, and August, and rake it over frequently, that it may become finely pulverised by being exposed to the sun and air, which will sweeten it, and extract all its noxious qualities; and if your compost is even completely rotten, and two years old, still, before you use it, lay it thin as before mentioned for a week or ten days, raking it once a day or oftener, as it is not worth while to run a risk of losing a single plant that is scarce and valuable, by not having the compost perfectly sweet and wholesome; for he says he had observed that mould, if it is laid in a heap any time, will create an acidity which is prejudicial to plants in general, and which can be only removed by being spread thin, and turned frequently, before potting. (*Emmerton*, 64.)

GENERAL CULTURE FOR BLOOMING.

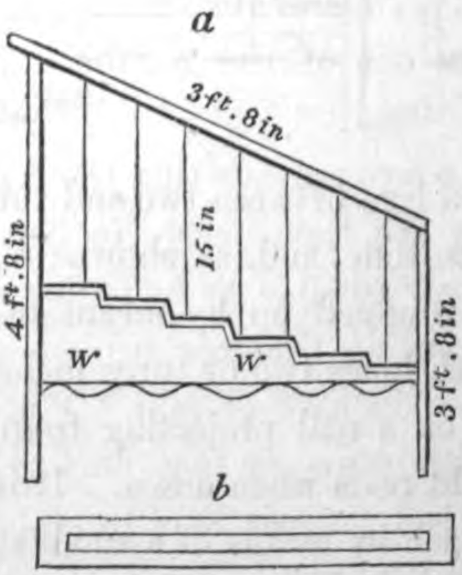
The treatment of the superior varieties of the Auricula, solely for the sake of their bloom, may be advantageously considered in three separate subsections, the attention they require being very different at their three annual periods of life.

1. *The Winter, or period of rest.*—The objects to be attained at this time of their cultivation, is freedom from excessive wet, protection from intense frosts, and the admission of air freely. This period extends from the close of October, or beginning of November, accordingly as the severity of the season may begin, early or late, to the end of Jannary. The late Dr.

Horner, of Hull, one of the most successful cultivators of the Auricula, recommends, for its winter residence, a frame, specially constructed for the purpose, and there is no doubt but that it is the best that has hitherto been proposed for the purpose. It facilitates the admission of light and air, can be easily covered during severe weather, and permits the ready performance of any requisite watering, or other treatment. The following is a front view :—



It stands on legs between two and three feet high; the top lights slide, and, as shown in the diagram, may also be propped up by means of an iron bar, perforated with holes two or three inches apart; and which catch on a nail projecting from the wood on which the light rests when down. It is permanently fixed to the sash by means of a small staple, forming a moveable joint, and when not used lies along its lower edge, and is there secured. The front lights let down on hinges; the ends are also glass; and in the back, which is wood, there is a door for the convenience of getting to the pots behind, and also for thorough ventilation. There are five rows of shelves, graduated to the slope of the glass; they have a piece an inch wide sawn out of the middle; there is a space also left between them; so that the bottom of the frame is quite open, for the abundant admission of air to circulate thoroughly around the sides and bottom of the pots. By letting down the front light only, the plants may be left for days together, exposed to all the advantages of light and air, without care or notice, and when it is desirable to give them the benefit of a shower remove the top lights. The following is an end view of the frame, which, by



measurement, is 4 ft. 8 in. at the back; 3 ft. 8 in. in front; 3 ft. 8 in. in depth, from front to back; and 15 in. from the shelves to the glass top light: the rise between the shelves is two inches, and the whole length of the frame (two lights) is 7 ft. 2 in. The shelves are made 5 in. in breadth, with about an inch sawn out of the middle, the whole length, simply that the pots may not stand in wet or damp; the air thus also permeates the crocks inside the pot; this is important. *w w* is simply a skirting-board of strong deal, partly for ornament round the frame, and in part for strength, and for breaking the wind from blowing, maybe too roughly, in eddies, among the pots; the top lights slide, or may be pulled down in front, as the lights of a green house, &c. The shelves are supported midway by a rest, as at the ends. Fig. *a* is a vertical section of the frame; *b* is a shelf, with an inch sawn out of the middle. (*Gard. Chron.* 1841, 550.)

Dr. Horner recommends that the Auriculas should be placed in the frame early in November, giving them all the air possible, as by letting down the front lights and opening the door behind—the top lights being kept on in case of rain. Watering must be gradually withdrawn, so that during December and January the soil be just kept from being absolutely dry; if it be kept wet or damp, the plants will be in great danger of contracting disease, and of suffering from frost. In winter, during intense frost, the frame must be protected with efficient covering; two stout blankets, with an outer coverlet of tarpauling, are the best, and, in the end, the cheapest materials. If not protected from severe frost, many of the flower-stems will be found dead, or with only two or three pips at the blooming time. In winter, during milder days, the plants should have sufficient air.

Mr. Emmerton used to move his plants into their winter abode somewhat earlier than Dr. Horner, and used small common cucumber frames instead of a particular structure. These will do, but require much more care. He recommends the frames to be about three-and-a-half or four feet long, and each light about three feet wide, as being most easily managed, and that the plants be put into them about the middle of October. The frames to face the south.

Some growers keep their pots during the winter months plunged in sawdust or ashes, but the greater number keep them surrounded by air. The former mode is safest in very severe winters, as it greatly protects the roots from frost. (*Maddock's Florist's Dir.* 116.)

During the autumn and winter months, even down to the 5th of April or thereabouts, expose them, during the day, to as much air as possible, by having the lights entirely off (except in rainy weather), and then have the frames raised on bricks; for, during the months of November and December, it is necessary they should be kept very dry, and more so in December, as in case of a severe frost the weather has then less power on the roots of the plants. During rain the lights should be kept over the flowers, but by no means close shut down, but admit all the air you conveniently can behind, as the Auricula itself is quite as hardy, or nearly so, as the common Primrose, but they cannot stand the heavy autumn and winter rains, the greatest enemy this plant has. Towards four o'clock in the afternoon the lights should be pulled over the flowers at this season, and shut close down, with about two or three mats thrown over them, and so to remain till about eight or nine o'clock next morning, when, if it does not rain, snow, or hail, they should be exposed again to the open air in the usual way; but if it rains, take off the mats only. In January, if the season has the appearance of open weather, you may treat your plants nearly in the same manner as the two last months, but if there is snow, and the frost severe, you must be rather more cautious as to the exposure; a trifling frost is of no serious consequence to these hardy plants, but do not have the mould severely frozen in the pots, as by the end of January the bloom is formed, although very low in the heart of the plant, and to get them severely frozen would be risking too much. But if there is likely to be a continuation of frosty weather, and the plants have been close shut down for three weeks, let the snow be taken off the mats, and the lights removed for a few hours in the day, or give plenty of air behind, and if the sun should break out for two hours, by all means let them enjoy it. At this season cover well up as early as three o'clock in the afternoon, and in January, if severe weather, add an extra mat or two. If the weather has become mild and open about the 18th or 21st of January, your Auricula plants at this time ought to be very dry; if that be the case, you may give them some water, or allow them to have three hours' moderate rain, provided it comes from the south-west, and let it be repeated every opportunity till the mould has got moderately moist. (*Emmerton*, 81.)

Mr. Hogg's directions for admitting air, &c., if common frames are used, are very judicious. He says:— Let the frames be raised on a few bricks, to admit a free current of air under them, and so let them continue as long as the weather is open and temperate. As soon as the frost sets in, remove the bricks, and let the frame rest on the ground. Let the pots be set on four inches deep of coal-ashes, and be kept rather dry than otherwise till February, receiving the water you give them through the small pipe of a water-pot; be careful also not to let the water run into the heart of the plant, and contrive to give it them when the air is mild, and the wind southward. If the surface mould in the pots becomes incrusted, stir it slightly with an iron skewer or other pointed implement. Remove decayed leaves as they appear.

Watering in Winter.—When the plants are first placed in frames, and for about a month after, continue to water to nearly the extent of the summer supply, that the previous repotting may have its full effect on the plant. This is a point of the first consequence, and so treated, with the extra warmth of the sun (for always select a southern aspect for wintering), they become thoroughly re-established in the pots, and form a new set of leaves, before the severe weather occurs. When this new growth is complete, which it usually is by November, the supply of water is reduced to a small quantity, applied about twice a week, just so much as will keep the soil moderately moist; and this is continued through the damp weather usual to this part of the year, until the arrival of clear frosty nights: then it is that the error of keeping the soil dry becomes apparent, for it will be found that, after three or four days' freezing, it is as perfectly incapable of supporting the plants as though it had been exposed for the same period to the effects of a summer's sun. To avoid this, let the Auricula grower give, unhesitatingly, a full watering whenever a favourable opportunity occurs in such weather, so that the soil may hold plenty of moisture when likely to be frozen hard. It may be said, the presence of extra water will but increase the intensity of the frost; but the plants are sufferers to a much greater amount, when, from the dryness of the earth, the moisture of their systems is absorbed. (*Flor. Journ.* 258).

FEBRUARY.

At the close of this month, or very early in March, accordingly as the season is forward or late, the pots of plants for blooming must be dressed. So soon as the weather appears settled for a succession of mild days, carefully take as much earth out of the top of the pots as you can, without disturbing the roots, and put in fresh compost, formed of two parts cow-dung and one part light loam. Be careful not to fill the pots too full with this fresh compost, but leave at least half an inch from the tops empty, that the waterings may sink to the roots, and not run over the edges; by doing this you will more easily be able to take off the decayed leaves from around the plants.

A still better plan is adopted by the Lancashire Auricula growers. The soil is raised in the centre, as represented in the following section.

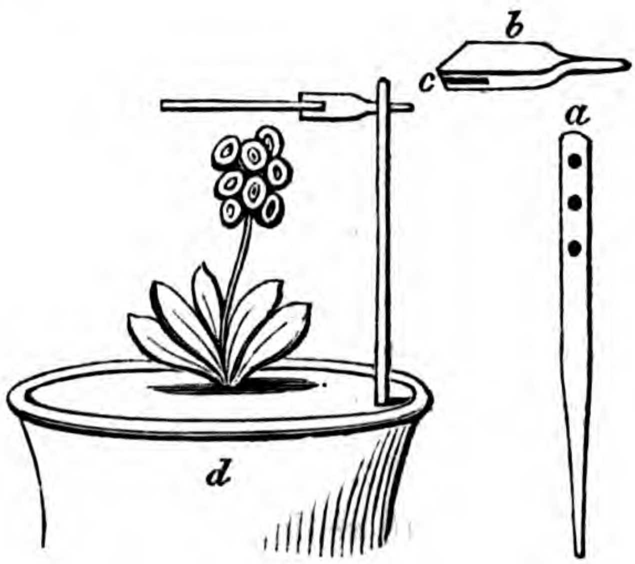
Water is poured round the edges of the pots, and if exposed to heavy rains, the superfluous wet runs to the sides, and more readily passes away.

If any plant produces more than one principal stem, pinch off the pips of the smallest and weakest, in order to render the blossoms of that remaining larger and more vigorous. It is a curious fact, that those sorts which are naturally possessed of a fine green on the edge or margin of the flower are often known to lose that property when the stem proceeds from the very heart or centre of the plant; whereas those stems that proceed from the side produce larger pips, possessing their true natural colours in much greater perfection; these last are called the winter stems, because they are usually forwarder, and produce their flowers rather earlier in the season than those which proceed from the centre of the plant.*

When the pips become turgid and begin to expand, they must be preserved from rain, nor should they remain any longer in a situation exposed to cold winds; but such plants ought to be removed to a sheltered, shady corner, and have small hand-glasses suspended over them in such a manner as to preserve the bloom from rain, &c., and yet admit a free circulation of air. (*Maddock*, 117.)

* It is a singular fact, that a winter truss of Lee's Colonel Taylor is generally finer for an exhibition than any other, and when caught in time rarely fails to take a first prize.

Another simple mode of preserving the bloom from rain, adopted by the Lancashire growers, will be best understood from the following sketches and references :—



a is a lath, about one foot long, perforated with three holes, at intervals of 2 inches. *b*, a flat piece of wood, the broad part about 2 inches square, and with a tapering handle, about 3 inches long, by which it can be fixed into the holes in *a*. A nick, 1 inch deep, is cut with a saw at *c*. In this nick is inserted a plate of glass, 6 inches long and 5 inches wide. When thus put together, and the sharp end of *a* thrust into the soil of the pot, at a proper distance from the flower, it forms a shelter as represented by *d*.

Draw the lights off during the greater part of the day, and give the plants all the air possible, to prevent the stems being drawn up weak, and let them receive all the gentle rains that fall from the middle to the end of March, to encourage and promote their growth; but shut them close at nights, and give extra thick covering to prevent the opening blossoms being nipped by the frost, which will still frequently recur at this season; for whatever petals are touched by frost never become level, nor show their right colours. If there does not occur rain sufficient to reach their roots, at the bottom of the pots, give the plants manured water twice, and do the same again in March, allowing a week between each watering. (*Hogg*, 135.)

Take the offsets out of the small pots with all the earth about them, remove a little of the earth from the top, and place them into larger pots for bloom also: this should be done in open mild weather; and your plants now should be exposed to all the gentle rains in this month, and at the same time carefully defended from frosts and hail storms, that they may produce fresh roots the sooner. (*Emmerton*, 88.)

MARCH TO MAY—BLOOMING PERIOD.

The most critical period has now arrived, for, to bloom Auriculas well, too great attention cannot be paid to them at this period for about four or five weeks, to prevent them from being set, or checked by frost. This strict care commences about the 20th of

March, and ends by the 25th of April, or thereabouts. No flower can be considered in full bloom till the pips are expanded; and most likely in Lancashire and Yorkshire they are not so forward by seven or eight days. To draw these flowers up by glass or any other artificial heat is highly injurious. Many florists keep their lights continually over their flowers, day as well as night, from the 1st of January till the 1st of May, and only admit a current of air behind their frames; this is the rock, fatal to bloom, so many split on; it draws up the flower stem, and renders it weak and incapable of producing a bold truss. To bloom an Auricula in perfection, it does not require to be continually under glass night and day longer than twenty-four days, or thereabouts, say from the 4th to the 28th of April; you will then find your middle pips expanded, or nearly so, and well adapted to be exhibited on the stage. Be careful during March and April to protect them from snow, sleet, and hail storms. Sometimes the sun has been so powerful by ten or eleven o'clock, about the end of March, as to make it requisite to put the lights over them, and shade them a few hours. However, so soon as an opportunity offers, expose them to the natural air again. In the first week of April, or thereabouts, it is requisite they should have glass completely over them night and day, till they are in full bloom; but during their stay under glass, admit a proper portion of air behind the lights, and shade them when requisite. This treatment is necessary for ten or twelve days, or until the master, or the top, pips are the size of a full-blown cowslip; much depends now on the state of the atmosphere, but usually a full south aspect is much too sunny, will over hasten the bloom, and fade the colours; should this be the case, an immediate removal to a full east aspect is desirable, if the weather will admit, under a wall, or other close fence; place hand-glasses over the plants, and by remaining ten or twelve days, or thereabouts, the earliest blossoms will be in such a state of forwardness by the end of April, as to be fit for removal to a full north aspect on the Auricula stage, or any other shady situation. The mats, &c., should be taken off the glasses about seven; and if it proves sunny, they should be shaded at half-past nine in the morning till about twelve or one, when the sun will be off this aspect. Have the hand-glasses washed inside and out before placing them over the flowers, as dirt and dust injures the blossoms. The plants should be exposed to all rains which may fall in the day from the south and south-west, from the beginning of February till about the first week of April, but more particularly after the blooming plants have been moulded up. As soon as the heavy fall of rain is completely over, shut them up close, and cover them warm. At the beginning of April, when they have pushed up their flower-stems, they must no longer be exposed to showers of rain, but the soil must to the end of the blooming season be preserved in a moist state. As the pips, if frosted when about to expand, will never bloom flat, the frame must be carefully protected, as first described, every night. In watering the plants great care must be taken to avoid the foliage, and if a drop has accidentally fallen into the crown of the plant, it must be extracted by means of a camel-hair pencil, or decay, probably, will be induced. A small watering-pot, with a spout a foot and a half long, bent at the end, and then contracted to the diameter of a goose-quill, should always be used for the purpose of watering. When the pips are just expanded into bloom, the frame, which has hitherto been exposed to a southern aspect, should be removed into the shade, or what is more feasible, the plants may be placed under hand-glasses, in a calm and shaded part of the garden, with the benefit of two hours morning sun. The pots are not placed on the ground, but on shelves graduated according to the fall of the glass lights: slide doors are made in the front and back of the frame, by which means any quantity of air can be admitted, freely to circulate around the bottom, sides, &c., of the pots and plants; it is most injurious to admit air in the common way, by lifting up the glass lights, as the cold air is thus suffered to blow directly upon the expanding blooms;

hence, the very great advantage of the contrivance just described. As the pips expand, the smallest, least perfect, and over-crowded ones must be carefully thinned out, leaving a truss of five, seven, or nine. When in full bloom, the plants may be removed to any other situation the grower may fancy, as, for example, to a cool, airy greenhouse, where their beauties can be conveniently seen and examined. (*Johnson's Dict. of Modern Gardening.*)

The blossoms must not only be protected from the rains, but also from the mid-day sun, by a covering of calico oiled, or treated with Whitney's composition. Notwithstanding this, you must still shut them up close at night, and even cover them with an additional mat, to prevent the blossoms being checked or injured by the frost. This is the critical time that requires the most particular care. As this flower produces more pips and blossoms than can expand at one time, it is necessary, at the beginning or so of this month, to cut out, with great care, the interior or middle pips, reserving not fewer than seven, nor more than thirteen; they should be taken out two or three at a time, and it requires some taste to perform this operation well, that the blossoms which are left may grow in a regular equidistant form, so that such thinning of the pips shall not appear to have taken place, but that they had naturally grown in that form, and with that number. By thus timely reducing the quantity of the pips, the rest are enabled to increase greatly in size as well as beauty, room being given to all the pips to expand, and become flat and level. (*Hogg*, 136.)

Cupping.—This is the technical name given by florists to the form assumed by pips of the Auricula, when their petals turn up somewhat in the manner of the Cowslip, instead of spreading back and forming a level disk.

Flowers, whose petals are of thick, firm texture, are generally inclined to cup, and when this is the case, they should be exposed for a few hours, during two or three days, in the very face of the sun, under a hand-glass, shaded with a piece of mat or gardener's blue apron. This warm confinement under the glass has the effect of gradually producing a greater expansion of the petals, and of making them pliable, so that with a little care, and a thin piece of smooth wood, you will be enabled to lock the edges of the pips under one another and bring them level.

A piece of smooth ivory, with a hole in it, nearly the size of the pip, if pressed lightly upon the pip, will also help to bring it level.

Stage.—That which we have already given, as recommended by Dr. Horner, is intended for this purpose, and there is another recommended by Mr. Henderson, of Delvine, N.B., who says his Auricula frame answers all the purposes of frame, hand-glass, and stage, used by the English florists; at least, to make it do so, he has only to erect a screen of matting on poles in front, during the flowering season. A sketch, or plan, of the frame is annexed :—

FIG. I.

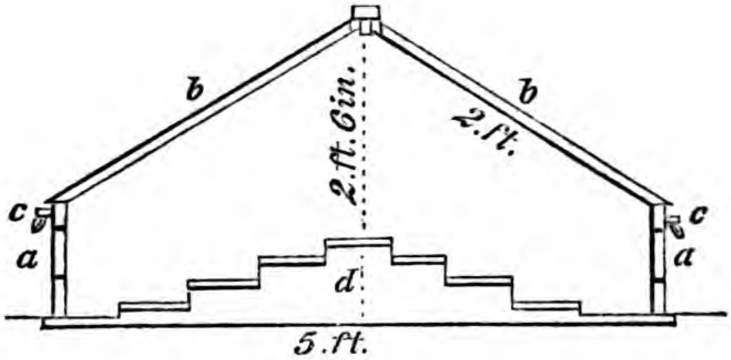


FIG. II.

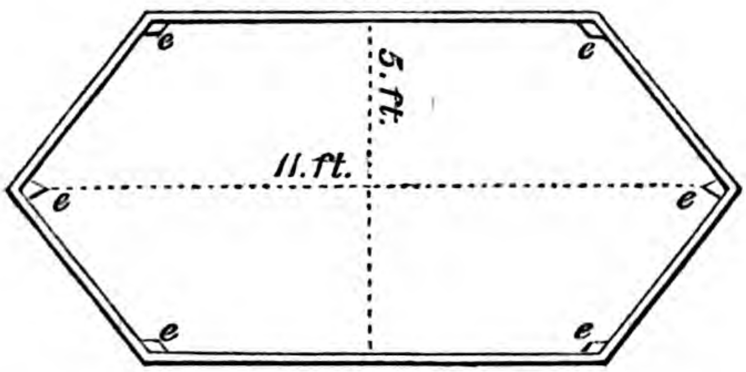


Fig. 1. *a a*, ventilators, of which there are eight; *b b*, sashes, with hinges at top; *c c*, handles, two on each side; *d*, stage, for holding 130 pots.

Fig. 2. *e e*, blocks of wood bolted to the sides to strengthen the corners.

The following is recommended by Mr. Maddock for the summer repository of the Auricula :—Let a bed of coal-ashes be formed in the place where it is intended to be erected, about five or six inches thick;

or a platform of plain square tiles, closely fitted to each other, on the surface of the ground, to preserve the pots from the common earth worm; upon this foundation, rows of bricks are to be placed, in straight lines, about two or three inches asunder, which will allow a free circulation of air under and between the pots when placed upon them, an object of great importance, especially in warm weather.

The plants, by the above plan, will be raised from nine to twelve inches above the level of the ashes or platform.

There should be two rows of substantial stakes, three feet long, and five inches by three wide, one row of which should be placed on each side, at about three or four inches from the two outside rows of pots; these stakes should be driven twenty inches into the ground, with their narrow sides towards the pots, and have notches cut in their tops, to receive the edges of the shutters they are intended to support. By way of illustration, suppose the whole length of the platform to be twelve yards, and the width three feet, it will contain seven rows, and each row about seventy pots, a sufficient number to constitute a moderate collection for a private gentleman. Three shutters, made with feather-edged inch deal boards, each four yards long, and two feet six inches wide, will reach the whole length on one side; three of the notched stakes will be sufficient to support one of these shutters; of course 15 stakes at proper distances will completely answer the purposes on one side: the notches are to be cut in the shape of a V, two inches deep and three inches wide at the top, which will give room for the shutters to move backwards and forwards, without difficulty, or danger of slipping out.

Both sides are thus to be provided with stakes and shutters; the upper edge of the latter should meet over the centre of the platform, when the plants require to be covered with them, in the form of the ridge or roof of a house, well fitted, and sloping equally on both sides, so as to throw off rain, without even admitting it to drip through upon the plants in any part.

It is necessary that a rail, or row of stakes, of a proper height and length, should proceed from the ground between the two middle rows of pots, to support the shutters when closed or closing, especially as it is usually more convenient to begin to cover or uncover on one side first, and finish on the other: without a support of this kind, in such case, the shutters must fall down upon the plants: a similar exterior rail, or row of stakes, is necessary on each side, to support the shutters when open, with the same degree of slope, in a contrary direction, than when closed; by which means the plants will have a free communication with the air, whether covered or open; nor are they entirely deprived of light when the shutters are closed, because the lower edge of the shutters is as high, or higher, than the top of the plants at all times. The peculiar advantage arising from this plan is, that when the plants require to be shut up from excess of rain, they have at the same time the advantage of a continual supply and free circulation of fresh air, which passes amongst their leaves in all directions; whereas, those who are obliged to shut up their plants in a close frame, to exclude excess of rain from them, oftentimes shut them up in a wet state, as soon as it is judged they have had a sufficiency; this is a very dangerous though not unusual practice, and often produces a mildew, which is attended with the most destructive consequences.

SUMMERING—JUNE TO OCTOBER.

There has been much disputation as to the advisable time for repotting the Auricula, which should be done every year without fail. Some florists do not transplant, or repot, as it is termed, until the close of August or early in September; and Mr. Hogg recommends either June, July, or August, for that, if repotted earlier into fresh stimulating earth, this is liable to excite them to bloom in the autumn, which is most destructive to their spring beauty and excellence.*

* Potting early in August is to be preferred, if the object in

Our own experience is against this result being produced by early repotting. In the first place there is no need of using a stimulating compost at the time of repotting; and in the second place, the check given to the plants by the transplanting has a decisive tendency to prevent autumn-blooming.

Maddock, Emmerton, and Dr. Horner, all agree in recommending early repotting, and we give the latter's observations without curtailment.

The best time for potting is immediately after the plants have bloomed; for, on account of the long previous confinement in the frame, the frequent waterings, and excitement of blooming, the Auricula is very apt to contract disease, especially rot or decay in some part of the main or tap-root. This, in repotting, is at once detected, and consequently the life of the plant saved. Moreover, by early potting, ample time is given for the pot to get well filled with young healthy roots before the approach of winter—the great secret of a vigorous bloom the following spring. *Neglect of yearly repotting is a great evil.*

Potting is thus performed:—1st. Put at the bottom of the pot at least one inch and a half of crocks of broken garden-pots; on these place a thin layer of decayed leaves unbroken up; they prevent the soil

view is to obtain offsets, for the plants make their increase in this mode just after they have done blooming, and potting at that time stops the process.

from filling up the interstices between the crocks, and are acceptable to the roots of the plants.* Next fill up the pot, within about two inches or so, with the compost, leaving it slightly coned; put a little sand, and on this place the end of the tap-root, and having disposed the roots regularly over it, let the pot be filled nearly to the brim, so that the soil just covers the base of the lowest leaf. Now strike the pot smartly two or three times on the ground, and then remove it to its summer quarters, having a north or north-east aspect, when water must be given just sufficient to moisten the soil, and repeated at the end of a week, not before. In filling the pot with compost, put in about three fingers full of decayed leaves, not leaf-mould—a pinch here and there. The following year, in repotting, an unusual mass of roots will be found piercing these decayed leaves; they evidently afford to the plants very acceptable nourishment and drainage. Previously to the operation of potting, the plant must be prepared, by carefully crumbling off the old soil with the fingers, and then washing the roots in water, in order that any decay or disease may be detected, in which case it should be effectually cut out with a sharp knife, and the main root should

* In Lancashire they very generally use rushes instead of leaves. They are cut into small pieces, and the roots of the Auricula certainly seem to delight in them, often penetrating the pith of the rushes.

then be shortened to within an inch of the leaves, leaving only the young and new fibres or roots. One great and fatal cause of the dwindling and disease of *Auriculæ* is the leaving too long a tap-root; it will most assuredly decay, and eventually kill the plant. When seed is required, repotting the breeders must be deferred until August. (*Johnson's Dict. Modern Gardening.*)

Pots.—The smaller the pots, consistent with the due supply of nourishment, the better, not only for convenience and economy of room, but because the needless development of root in any plant is always at the expense of its parts of fructification. Consequently we recommend the adoption of pots having the dimensions prescribed by Dr. Horner, observing, at the same time, that repotting annually, by supplying fresh soil every year, enables these smaller-sized pots to be employed without detriment.

The pots for a full-sized plant should not exceed four inches at the top, and three inches at the bottom, inside measure; they should also be made five-and-a-half inches deep to allow of abundant drainage, and should not be hard-baked, but left as porous as possible.* It is a great and almost universal fault to

* Against this recommendation by Dr. Horner, to employ slightly-baked pots, we enter a decided protest. In 1844, Mr. Slater lost a great many Auriculas that were growing in these porous pots, whilst those in hard-baked pots did very well.

use pots of too large a size. (*Gard. Chron.*, 1841, 397.)

Mr. Emmerton recommends the employment of a larger pot, and as he only repotted once in two or three years, such increased size was, under such treatment, advisable. The dimensions of the pots, and the mode of repotting, recommended by him, are as follows:—For large blooming plants the pots to be eight inches high; five-and-a-half inches diameter at the top, and four-and-a-half inches at the bottom. In transplanting, place by the side of the hole a small piece of tile, and over the hole a hollow oyster-shell, resting on the edge of the tile (this plan drains off the water well), after which, fill up two or three inches deep with pieces of old loam, but not sifted; if it has been soaked in manure it will be no worse; after this, fill your pot about three parts full with the prepared compost, and let it be well shook down on your potting board; this is too often

But this is not the only evidence against the practice, for the Lancashire weavers are some of the best growers of the Auricula, and on no account will they plant one in a soft, or slightly-burnt pot. The pots the weavers usually bloom their Auriculas in, are eighteens, about six inches diameter at top, and the same in depth. There can be no doubt, that the evaporation from the sides of porous pots must cause such a degree of cold as to keep the roots in a temperature relatively much too low, compared with that in which the leaves are growing.

neglected, but it assists the settling down of the mould, and will prevent the plant sinking in the pot, which is an eye-sore: trim the small roots or fibres to about three or four inches long, and be careful to spread them as horizontally as possible; press the earth tight round the edges of the pot, as well as in the middle round the neck of the plant; it ought to be firmly fixed to facilitate its growth; the mould, if kept in a shed, and is as dry as gunpowder, is the better for potting. Water those plentifully that have not been much wounded with a knife, by placing your pots in a tub, or other vessel of water, three parts up their sides; if the compost is dry, the water will, by this means, draw up to the roots sufficiently, which you will observe by the dry earth on the top turning black; those that have been much wounded should have water more sparingly, lest it cause them to rot. As soon as they are transplanted, place them all in a situation where they may not be exposed, either to sun or wind, if possible, till they have taken fresh root. If they are well watered when planted, they will require no more for six or eight days, or a fortnight, especially if it be a moist air, and the wind is inclined to the south-west; after this, they should be kept moderately moist, but not so wet as when the blossoms are expanding themselves. Your plants will strike fresh root in about a month or six weeks, you must then water sparingly; it is not much required with this plant; but water, in very dry hot weather, early in the morning and evening, with a very fine rose, made for that purpose, all over the leaves, will be essentially necessary; but by ten o'clock the sun will have dried them. (*Emmerton*, 134.)

Mr. Henderson, of Delvine, N.B., agrees as to the best time of repotting, but as his practice differs in some particulars we will give the details he has afforded. He says, that the shifting season is always about the third week of May, when the plants have done flowering. At that season, shake the mould from the old plants, and cut the end of the stump up to the fresh young roots, if it has grown too long (Mr. Henderson is speaking of those plants which have been in the largest-sized pots for two years). After dressing the wounds with gum-mastic, to prevent gangrene, the plants are to be repotted in five-inch pots. Next May they are shifted, with the ball entire, into six-inch flowering pots. So that, from the first potting of the young plants in small pots, to a complete shifting, four years elapse; the plants having been one year in small pots, one in the second size, and two in the largest, or third size. A little river sand is put round the stems at all the shiftings; and if any wounds are made by taking off the suckers, they are dressed with mastic. At all times the stems are cleared of sprouts above ground as they appear, but suckers from under are allowed to grow, in order to form young plants.

When the shifting and top dressing are over, the plants are set out upon bricks or boards; if on the former, make a bed of sand under the bricks; if on the latter, they are raised above the ground, so as to prevent worms getting into the pots. (*Caled. Hort. Mem.* iii. 230.)

Mr. Emmerton says, upon the same point, that certainly the best time for repotting is soon after they are out of bloom, say about the third week of May, and more especially if the weather is a little inclined to be showery; but they may be planted with great success from the 29th of May to even as late as the 13th of July; on no account remove a general collection a week later, at least those you intend to bloom very strong: by this means they have three or four months to get well rooted before winter, which they ought to have; and if you transplant them early in the spring, it will be so near their time of blowing, that the check they will receive by transplanting will prevent their blooming strong. If a very strong superior bloom of flowers be desired do not suffer any offset to grow on the stock of the mother plant without fibres, but rub them off when they are about the size of hemp seed; but those that spring up below the surface of the earth, you are at liberty to use your own pleasure about.

By no means remove your large blooming Auricula plants in dry hot weather, as by shaking the mould clean out of the plant the roots will not freely draw fresh fibres, except the weather is inclined to be showery, and what is termed a cool moist air. Fine young maiden plants, in small pots, may be repotted even in dry weather, for they can be slipped out of the pots with the whole ball of earth, and then immediately planted in a full-sized blooming pot for the ensuing season.

Treatment after Repotting.—We have already given the requisite directions for the placing the shifted plants in a place having a northern or north-eastern aspect, with shutters or other facilities for occasional shelter. Water must be given at the time of shifting, and afterwards at least four times a week, if dry weather, during the whole of June, July and August. During September and October they require not more than half that quantity of water.

Do not cut down the flower-stem when the bloom is past, as it sometimes rots down into the heart, and thus injures the plant. It is better simply to remove the flowers, leaving the stalk until it becomes sufficiently ripe to separate freely from the plant. (*Gard. Journ.* 1846, 324).

DISEASE.

The *Canker*, or *Rot*, is the only disease afflicting this flower that we are acquainted with. This is really an ulceration, or moist gangrene, seated in the root. The first symptom of the disorder having attacked a plant is its loss of verdure, and its assuming a yellowish sickly appearance. Soon after it decays on one side, and becomes crooked, or else, the main root of the plant rapidly decays quite through, and the head drops off; in fact, the juices of the plant are vitiated at the time the foliage begins to appear sickly, so that no time must be lost in fresh potting it into proper soil, and removing it to a cool shaded situation: this is the only likely method to recover the infected plant; but it is certainly more advisable to prevent the occurrence of so dangerous a malady, by fresh potting the plants in the spring, than to run any risk by deferring the operation till autumn, or postponing it to the second year. (*Maddock's Florist's Direct.* 103.)

Some florists have thought the disease epidemic and contagious, because, when it does appear, it usually attacks many plants in the same collection. This, however, is no such proof, but merely evinces that the whole have been rendered liable to the disease by being all equally mismanaged.

We quite agree with Dr. Horner in thinking, that the disease is not contagious, but that it is simply the result of bad cultivation; what produces it in one plant, produces it in all. Want of drainage, old tap roots, damp, and confinement, are, severally and collectively, the principal causes of rot in the Auricula. To prevent it, repot annually, taking care to shorten the tap-root (a part peculiarly liable to canker and disease) to within an inch or an inch-and-a-half of the insertion of the leaves. Secondly, fill the pot nearly one-third with broken crocks. Thirdly, let the pots, in summer and autumn, stand in a shady, airy part of the garden, and elevated two feet above the ground. And, fourthly, place them, in winter and spring, in such a frame as is before represented. (*Gard. Chron.* 1843, 860.)

There are two other points deserving particular attention, to secure safety from the disease. Of these, the first is to have plenty of rubbly pieces of charcoal among the drainage, for these are grateful to the roots, at the same time that they are antiseptic; and the second is, that great care ought to be taken not to rend the main root of the mother plant in removing the offsets, for this often induces decay; less injury will arise from a clean cut with a sharp knife than from a forcible separation of the offsets by the fingers.

INSECTS.

The *Aphis*, Louse, or Green Fly. Mr. Hogg says, that if Auriculas, in the summer, are attacked by this insect, they ought to be put into a frame and smoked with tobacco; for if they are suffered to continue so infested, it is impossible for them to thrive.

This treatment is permissible if the insects appear after the bloom is off; but they also come, occasionally, whilst the flowers are in their beauty. The only mode of clearing off the enemy is, then, to remove them, one by one, with a camel's-hair brush, and as the plants are small this is not an arduous task.

Slugs do great damage at night, chiefly by crawling over the leaves until they reach the blossoms, of which they injure the eye materially, especially by eating the thrums out. To prevent this, sprinkle the tiles or slates, where the flowers stand blooming, with two or three handsful of salt at night, just before you cover up; unslacked lime would answer the same purpose. To these applications there are the objections, that they are unsightly, and that exposure to the weather soon renders them inefficacious. A permanent protection is, to wind some hair rope round the legs of the stand, or around each pot, cutting across the strands of the rope with a sharp knife, so that the hairs start up at right angles. These form a *chevaux de frize,* impassable by slugs or snails.

Bees.—To prevent the humble, or any other bee, getting to the bloom while under glass, to which they will do no great injury, cover the openings either with yellow or green canvass, or, which less obstructs the light, with the lace net recommended to be used for the exclusion of insects from the breeders.

THE ASPARAGUS.

HISTORY.

Asparagus is known to have been cultivated as a culinary vegetable for nearly 2000 years. This cultivation originated, probably, in Greece, and has thence been diffused to the rest of Europe; for its name is uncorrupted Greek, signifying a bud before it has fully opened, clearly pointing to the state in which it is used for culinary purposes; and every nation in Europe knows it by no other names than such as are derived and corrupted from the Grecian. In German it is *Spargel;* in Dutch, *Aspergie;* in Danish, *Aspargis;* in Swedish, *Sparis;* in French, *Asperge;* in Italian, *Sparagio;* in Spanish, *Asparrago;* in Portuguese, *Espargo;* and in Russian, *Sparsch.*

Asparagus officinalis, or Wild Asparagus, is found native in Japan, and on the sea-coasts of most parts of Europe; and from this, there is no doubt, our Garden Asparagus has been raised. High cultivation—the abundant supply of rich appropriate manure—will work strange changes in all plants; and we have no doubt upon our minds that—as in many similar instances—"the muck heap" has elevated the Asparagus of the beach into the Asparagus of the garden. It is quite true that some gardeners have failed in effecting this change; but, on the other hand, Miller and some more practitioners, equally trustworthy, succeeded in their experiments directed to the same point; and, in cases like these, one affirmative testimony is unshaken by a thousand negatives.*

Cato flourished about 150 years before the Christian era, and in his work, just quoted, we have a full detail of the mode of cultivating the Asparagus pursued by the Romans. These directions are an epitome of those which occur in Abercrombie, Miller, or any other standard work on horticulture. They are as follow:—"You must well work a spot, says Cato, that is moist, or which has richness and depth of soil. Make the beds so that you may be able to clean and weed them on each side; let there be a distance of half a foot between the plants. Set in the seed, two or three in a place, in a straight line; cover with mould; then scatter some compost over the beds. At the vernal equinox, when the plants come up, weed often, and take care that the Asparagus is not plucked

* Even Cato was aware that the Wild Asparagus (Corruda,) planted in rich moist soils, becomes that which is cultivated. (*De Re Rustica*, 6.)

up with the weeds. The year you plant them, cover them with straw during the winter, that they may not be killed. In the beginning of the spring after, dress and weed them. The third year after you have sown them, burn the haulm in the beginning of the spring. Do not weed them before the plants come up, that you may not hurt the stools. The third or fourth year, you may pluck them close by the root; if you break them off they yield side shoots, and some will die. You may take them until they run to seed. The seed is ripe in autumn. When you have gathered the seed, burn the haulm; and when the plants begin to shoot, weed and manure. After eight or nine years, when the beds are old, lay out a spot, work and manure it well, then make drills where you may plant some roots; set them well apart, that you may dig between them. Take care that the roots may not be injured. Carry as much sheep-dung as you can on the beds; it is best for this purpose; other manures produce weeds."

Columella, Palladius, and Didymus, also give us some more particulars of the Roman Asparagus culture, but nothing worthy of quotation in addition to the directions of Cato. That the culture adopted, combined with the mildness of the climate, was very favourable to the growth of this vegetable is quite credible, and we do not withhold credit from the relative statements of Pliny and Athenæus. Pliny states, that at Ravenna, which, be it remarked, is a sea-port, Asparagus was grown so fine, that three shoots weighed a pound.* Athenæus says, that, in Getulia, the stems were as strong as reeds, and twelve feet high. We do not disbelieve these statements, for we have seen, in England, six Asparagus sprouts weighing a pound, and its stems between eight and nine feet in heighth.

That it was a common and well-known dish at the Roman tables, appears from the habitual expression of the Emperor Drusus, when he required more than ordinary despatch, "Let it be done more quickly than Asparagus can be boiled."

It is more than probable that the Romans introduced the cultivation of this, with that of other products of the garden, into Britain. They would find it wild upon our coasts as upon their own, and would, probably, submit it to the same ameliorating culture. Be this as it may, it is quite certain that it was cultivated here at a very early period, and that its culture is detailed in the works of the earliest of our writers on such subjects.

Asparagus was cultivated in England, and known as Sparage, or Sperage, in Tusser's time, for, in his

* We particularly note that Ravenna is on the sea-shore, because the best Asparagus, perhaps, in Europe, is grown now on the coast of Spain, and salt is found to be for it one of the best of manures.

"Five Hundred Points of Good Husbandry," published in 1573, he says, "Sperage let grow two years, and then remove;" and Lyte, in his translation of "Dodonæus' Herball," in 1578, figures Asparagus, the Garden Sperage; and Corruda, the Wild Sperage.

Gerard's "Herball" appeared in 1597, and here five kinds are delineated:—*Asparagus sativus*, Garden Sperage; *A. palustris*, March Sperage; *A. petræus*, Mountain Sperage; *A. sylvestris*, Wild Sperage; and *A. sylvestris spinosus*, Thorny Sperage. The first and second, he observes, "differ not in kind, but only in manuring, by which all, or most things are made more beautiful and larger." In Gerard's time, however, manuring, he says, had increased the size of its shoots to no greater circumference than that of "a swan's quill."

Didymus Mountain, or rather Henry Dethicke, in his "Gardener's Labyrinth," published in 1577, has a chapter on "What singular skill and secrets are to be known in the sowing, removing, and setting again, of the worthy herb named Sperage." These secrets, however, as he unreservedly states, are mere extracts from the Latin and Greek writers, Cato, Columella, Pliny, Palladius, Didymus, &c.

Lawson, in his "New Orchard and Garden," published in 1626, does not even mention Sperage among his kitchen garden herbs. But in France great attention was paid to its cultivation. M. Quintyni, whose "French Gardener" was translated by Evelyn, in 1673, gives very full and correct directions for its cultivation. By allowing them to remain uncut for four or five years, he says, they were then obtained "as large as leeks," which seems to be a forestalling of our "Giant Asparagus."

Forcing Asparagus was introduced by the Dutch gardeners who came with William III. (1688). He delighted in blanched vegetables; and this, among our gardeners, being a novelty, was at first named here after its introducers. "It is with us (says Switzer) truly called Dutch Asparagus," (*Kitchen Gardener*, 173). This writer gives sufficient directions for thus obtaining it early, and even some 30 years before him, *viz.*, in 1697, Meager "mentions that the London market was, at that period, supplied with forced Asparagus early in the year. Some having old beds of Asparagus, which they are minded to destroy, and having convenience of new or warm dung, lay their old plants in order on the dung, and the heat doth force forward a farewell crop." (*English Gardener*, 188.)

From that time to the present the cultivation of Asparagus has advanced both in extent and excellence, until it has become a tenant of every country gentleman's garden, and is grown by many in perfection equal to that attained by any other cultivators.

It is especially cultivated, extensively, for the London market; and it is estimated that, in the parish of Mortlake alone, there are generally about 80 acres under this crop. One grower there (Biggs) has sometimes had 40 acres under Asparagus at one time. A great deal is also grown near Deptford; and one grower there (Edmonds) has had 80 acres entirely under this crop—a thing which must appear almost incredible to those who have not witnessed the loads of this article daily heaped on the green-stalls of the metropolis for the space of nearly three months. In this country, Dutch Asparagus was preferred at the end of the 17th century; and this variety is still distinguished for affording very thick shoots. In a garden formed at Dunbar, in the very beginning of the 18th century, by Provost Fall (a name well known in the mercantile world), Asparagus was for many years cultivated with uncommon success. The variety used was the red-topped, and it was brought from Holland. The soil of the garden is little better than sea sand. This was trenched two feet deep, and a thick layer of sea-weed was put in the bottom of the trench, and well pressed together and beat down. This was the only manure used, either at the first planting or at subsequent dressings. There was an inexhaustible supply of the article generally at hand, as the back-door of the garden opens to the sea-shore. (*Edinburgh Encyc.*)

It has now become an established and favoured vegetable over the most of Europe, even in its most northern divisions. Austria is particularly renowned for growing it of a large size and excellent in flavour.

We have a statement in Keysler's Travels, published in 1760, in which he says, that "the goodness of the soil may be inferred from the largeness of the Asparagus that grew last year at Damstadt, for one head of it weighed half a pound." He further adds, that the Austrian gardeners generally lay some light sticks over the Asparagus when it appears above the surface; these shelter it from the inclemency of the weather, and cause it to shoot up apace. Besides, by this contrivance it is kept soft, for it is apt to become hard when exposed to cold winds.

Asparagus is more rare, and highly prized in Russia, as may be concluded from the following narrative by Storch, in his "Description of St. Petersburgh." Such tricks on culinary vegetables are of a nature too gross, and involve too much manipulation, for being practised or even credited in Britain, if not related by an author worthy of belief. He says that, after Asparagus has been used at the tables of the great, the returned ends of the shoots are sold by the cook to itinerating green-grocers, who carve a new terminating bud, colour it, and add a bloom, in imitation of nature, make up the ends so prepared in bundles, with a few fresh stalks outside, and sell the whole as genuine asparagus.

The cultivation of this vegetable is introduced by our countrymen even into the hottest latitudes of the tropics.

Mr. J. Newman has published the successful mode he has adopted for obtaining it good in the island of Mauritius; and we have eaten of it—excellent in quality, and nearly of an average size—in Bengal. Daily irrigation is there the chief essential.

BOTANICAL CHARACTERS.

Asparagus Officinalis.—Common Asparagus, or Sperage. This vegetable is included in the Hexandria Monogynia class and order of the Linnean system, and in that of Liliaceæ of the natural arrangement.

Roots perennial, creeping, with very long, thick, simple fibres. *Stem* erect, occasionally procumbent, round, simple, and bearing alternate scales (or stipules without leaves below) in the upper part, branching in a panicled alternate manner. *Leaves* in tufts, very narrow and bristly, but flexible. *Stipules* solitary, membranous, triangular, acute, the upper ones ovate and jagged. *Flowers* from the axillæ of the branches on capillary simple stalks, drooping, white, row of the segments inflexed, in some the stamens, and in others the pistil occasionally abortive; style deeply three-cleft. *Berry* red. The above are the specific characters of the wild Asparagus found abundantly on parts of the southern sea-coast of England, as Weymouth, Harwich, Eastbourne, &c. In its wild state the stems are not thicker than a goose quill, yet it is from this, by good cultivation, that the garden Asparagus has been raised.

CHEMICAL COMPOSITION.

We are indebted for the following analyses to Dr. Thomson's valuable work on Organic Chemistry, where they have been ably collected and arranged.

Asparagus sap.—M. Robiquet found in this gluten, a resinous oil, albumen, asparagin, saccharine matter, potash, carbonate of lime, phosphates of potash and lime, and, probably, acetates of potash and lime. (*Ann. de. Chim.* lv. 152.)

The root of Asparagus was examined by M. Dulong d'Astafort. He obtained albumen, gum, a substance (asparagin) precipitated abundantly by subacetate of lead and nitrate of mercury; a resin; sugar, reddened by sulphuric acid; supermalates, chlorides, acetates, and phosphates of potash and lime; and iron. (*Journ. de Pharm.* xii. 278).

Asparamide, or *Asparagin,* is the constituent which imparts to the Asparagus its very peculiar flavour and properties. It was discovered in the juice of the Asparagus officinalis, by Vauquelin and Robiquet, in the year 1806. In 1827 Mr. Bacon discovered a principle in the root of the althæa officinalis, or marsh mallow, to which he gave the name of althein. Henry and Plisson repeated the experiments of Bacon, and showed that his althein was the same with the asparagin of Vauquelin and Robiquet. M. Robiquet in 1809 had discovered a substance in the root of the glycyrrhiza glabra, or common liquorice, to which Caventon afterwards gave the name of agedoite. This substance was further examined by M. Plisson, and shewn by him to be identical with asparagin. In the year 1830, M. Wittstock repeated the experiments of the French chemists, and rendered it probable that the asparagin obtained from the root of the althæa officinalis was formed during the process of extraction, and did not pre-exist ready formed in that root.

Asparagin crystallizes in rectangular octahedrons and six-sided prisms. It has no smell and but little taste. Its specific gravity at 55 degs. is 1·519. When heated it gives out ammoniacal water, showing that it contains azote as a constituent. At 57 degs. it dissolves in 58 times it weight of water, but it is much more soluble in hot water. Alcohol of 0·837 is a much better solvent of it than water; but it is insoluble in absolute alcohol, and likewise in ether.

According to Henry and Plisson, it may be dissolved in weak potash ley and thrown down from that solution by an acid. When digested with strong potash ley, ammonia is given out, and the asparagin converted into aspartic acid. When acids are mixed with it, they combine with ammonia, and aspartic acid is disengaged. This rather confirms the opinion of Wittstock, that asparagin is nothing else than a combination of aspartic acid and water. But if it were so, it is difficult to understand why acetate of lead forms no precipitate when dropt into a solution of asparagin; though it forms a precipitate when added to aspartate. Asparagin is not precipitated by the other metalline salts, nor by the infusion of nutgalls. (*Ann. de Chim.* xxxiv. 201—lvii. 88, and lxxii. 143; *Poggendorf's Annalen* xv. 346; *Journ. de Pharm.* xiv. 177.)

VARIETIES.

There are but two varieties—the red-topped and the green-topped. These, we believe, are permanent, the first having the largest and closest head, but the second being better flavoured.

There were formerly vended by nurserymen, the

Battersea, Deptford, Cork, Dutch, Gravesend, Reading and Mortlake, but it is now well-known that these were merely fine specimens of the two varieties above-named, improved by high cultivation. The same observation applies to the Giant Asparagus, which is only the red-topped variety induced to grow to a larger size by an unlimited supply of congenial manures during its growing time, and planted deep, so as to enable a great length of stalk to be cut. By this observation we do not intend to disparage this improved growth, for we think it well worthy of cultivation, but we wish to warn our readers not to be disappointed if they find, under a less stimulating system of cultivation, they do not succeed in obtaining such a large and satisfactory produce.

PROPAGATION.

Although Asparagus is propagated only by seed, yet the gardener may establish it in his beds either by sowing where the plants are intended to remain for production, or he may employ rooted plants that have already attained the growth of two or three years. As every removal, especially to a plant with such fleshy roots, is a check and injury to its vigorous growth, if plenty of time can be allowed for the plants to establish themselves previously to being cut, seeds are preferable to plants; but in cases where it is desirable to cut from the beds in the second season after they are formed, strong two-year-old plants will be more serviceable. (*Gard. Chron.* 1843, 73.)

Sowing.—As it is of great importance to have good seed, about the middle of May some of the finest heads should be selected and left for its production; and in autumn, when their seeds are ripe, wash these out of the berries, drying them as quickly as possible, and preserving them in a dry place until the following spring. The seed may be sown from the middle of February to the beginning of April; the most usual and best time is in the first half of March. The best mode is to insert the seeds by the dibble, nine inches apart, and an inch below the surface, two seeds to be put in each hole, or they may be sown in drills made the same distance asunder.

This will provide against the occurrence of failure, for if all vegetate, as the plants ought not to be nearer to each other than 18 inches, every alternate seedling may be removed. Sowing by the dibble or drill is far preferable to broadcast, admitting of cleaner husbandry and avoiding root entanglement, which is inconvenient whenever transplanting is required. If the seed be good, careful thinning will be required soon after the seedlings are well above ground, for a single grain often produces two or three Asparagus plants, bound together, from which the stronger shoot should be separated. Were they planted together, they would grow in a cluster, produce very little, and last but a few years. (*Cal. Hort. Mem.* iii. 425.)

Culture in Seed Bed for Transplanting.—Make choice of a piece of ground which lies dry and slopes to the south, so that the rain may run quickly off the paths; the lighter the soil is the better. Dig into the ground in the autumn a large quantity of good dung, and point it over in the following spring for the purpose of loosening the ground, and mixing the dung with it. If dry weather, the bed should be refreshed with moderate but frequent waterings, and if sown as late as April, shade is required by means of a little long litter during the meridian of hot days, until the seeds germinate. Care must be taken to keep the seedlings free from weeds, though this operation should never commence until the plants are well above ground, which will be in the course of three or four weeks from the time of sowing. If two plants have arisen from the same hole, the weakest must be removed as soon as that point can be well determined. Apply liquid manure and salt frequently during the summer, and towards the end of October, as soon as the stems are completely withered, they must be cut down, and well putrefied dung spread over the bed to the depth of about two inches; this serves not only to increase the vigour of the plants in the following year, but to preserve them during the winter from injury by the frost. About March in the next year, every other plant must be taken up and transplanted into a bed, eighteen inches apart, if it is intended that they should attain either another, or two years' further growth, before being finally planted out, or they may be planted immediately into the beds for production. It may be here remarked that the plants may remain one or two years in the seed bed; they will even succeed after remaining three, but if they continue four they generally fail. It is, however, certain that they are best removed when one year old.

The foregoing directions are very judicious, but as practices vary, and sometimes properly so, we will just detail our practice, as far as getting ready for the final planting is concerned. We prefer planting two year old plants, not that sowing in the bed is improper, but that this practice suits our rotation of crops best. We sow one small bed annually in the second week of March on highly manured ground: the manure in a very highly decomposed state. The beds are of course kept free from weeds, and watered occasionally. In the autumn, when the haulm is decayed, we cover the bed with six inches of half decayed leaf soil as a protection against the frost. In the month of April we prepare ground for transplanting then by digging deep and adding a great abundunce of decayed vegetable matter, wood ashes, or burnt materials, with plenty of rotten manure. The plants are taken up carefully when about four inches high, on a moist day; they are "tipped" at the root, dipped in a manure-puddle prepared on purpose, and placed in the bottom of a grass-barrow with high sides, containing a wet mat, which is kept constantly over them until they are transplanted. They are then inserted in rows in the prepared soil, nine inches between the rows and four inches between plant and plant. Nothing is necessary now but to give daily waterings when the weather is dry, and to keep them free of weeds through the summer. We generally, however, mulch with any leaf-soil or stable manure, three inches deep between the rows shortly after planting: this preserves the fibres from sudden and injurious vicissitudes.

For a bed $4\frac{1}{2}$ feet wide by 6 feet long, a quart of seed will be sufficient. If sown to remain, then for three rows in a bed, 30 feet in length, half a pint of seed will be necessary. The seed will come up in three weeks.

SOIL AND MANURES.

Asparagus being a native of the sea shore, and there only in sandy, shingly plots, from which an excess of water is removed immediately that the tide recedes, we thence may learn the contingencies essential to its existence, namely, the saline constituents of the sea, abundant moisture, and freedom from stagnant water to the roots. These are necessary for the plant's health, but to these must be superadded abundance of decomposing animal and vegetable remains, in order to make its growth gross and eligible for table use.

We may remark, that all good cultivation must be founded upon a similar attention to the same two points: whatever the plant's nature requires must be first secured to it, and then what art seeks to effect must be attained by additions to those requirements.

There have been repeated attempts to cultivate Asparagus, without the aid of the farm-yard manure, but always without that amount of success which is sure to attend a liberal application of the latter. This is not only a question of quality, but one of texture also; for Asparagus will root with the utmost rapidity and freedom in old thatch, or any other loose vegetable remains, providing the due amount of moisture is provided.

Soil.—The best of all soils for Asparagus is a rich sandy loam, mixed with a small quantity of broken oyster-shells. It should be at least three feet deep—if five, so much the better—and resting upon a porous subsoil. If the soil is shallow, it must be trenched to the above depth; and to secure a perfectly good drainage, the beds should be founded upon a layer of brickbats, 18 or 24 inches deep, with a drain directly from it to some outside ditch or other outfall.

As, however, many kitchen gardens are of a very clayey or adhesive character, it becomes a grave consideration how to improve such for the cultivation of Asparagus at the most moderate expense; for removing the whole of the soil, and substituting a fresh mass for the bed, is a process which cannot be at all times carried out. Soil of this character should, as before observed, be thoroughly drained, and this operation should take place in the autumn. In accomplishing this, the whole volume of the bed should be thrown out right and left, and remain in two sharply piled ridges until the early part of March, removing away, however, a considerable portion of the inferior or bottom soil or subsoil, in order to make way for other material to improve it. These ridges, in the course of the winter, will become somewhat mellowed, and fit to blend with any loose sandy soil, providing a thoroughly dry time be selected for the operation. Materials for this purpose should have been collected previously, and ready at hand when wanted. Ditch scourings, which had been laid to mellow, would be excellent, especially if turned once previously, and plenty of quicklime introduced. Loose sandy soils of any kind, the lighter the better, should also be used abundantly; and even plenty of clean sand, a good coat of coal ashes, and materials from the sea beach if at hand, especially if containing plenty of shells: any, or all, of these blended with the ditch-sourings would be found excellent materials for the case in hand. Plenty of manure also should be provided, and kept in two portions: the one containing old and rotten manure, and the other fresh and raw manure, or fresh manure and leaves blended. Equal portions of the above material and of the soil should be filled in when thoroughly dry, taking care to keep the raw manure at the bottom, and to introduce it of a rottener character progressively upwards. A little salt may be sprinkled with the whole mass in the course of filling in.

One thing we would here observe, and that is, that where strong soils are shallow, and if a stubborn and impervious subsoil exists beneath them, it would not be advisable to excavate, or, at least, to carry the depth of prepared soil below the heart of the subsoil. This we have often known done, and is, on the whole, a very doubtful proceeding, for excellent indeed must be the drainage which can keep a bottom of this sort free from stagnant water. We would rather carry the bed much above the ground level. The only fault of this latter proceeding would be this, that the beds would at times, during extreme hot weather, be too dry; this, however, might be easily remedied by summer mulching and occasional watering.

That part of the garden which is longest exposed to the sun, and least shaded by shrubs and trees, is to be chosen for the situation of the Asparagus quarter.

In France, when making an Asparagus bed, a pit is dug five feet in depth, and the mould which is taken from it sifted, taking care to reject all stones, even as low in size as a filbert nut. This, however, is a very erroneous practice, for not only should the stones be left, but broken oyster-shells be added, to promote the drainage. The best parts of the mould are laid aside for making up the beds. The materials of the bed are then laid in the following proportions and order :—6 inches of common dunghill manure, 8 inches of turf, 6 inches of dung as before, 6 inches of earth, 8 inches of turf, 6 inches of very rotten dung, 8 inches of earth. The last layer of earth must then be well mixed with the last of dung. (*Cal. Hort. Mem.* ii. 247.)

If the above materials were thus prepared twelve-months before they were required, and the whole being decayed together, could be cut down and incorporated at the time of making the beds, the mixture would be good. But to put the turf fresh in layers is interposing barriers most unnecessarily to the deep rooting of the plants, in which they so much delight.

That such materials would produce fine Asparagus there can be no doubt, and so they ought, for we have here 18 inches in depth of manure, besides 8 of turf, both of which are costly materials. What the Asparagus wants is a good body of a sort of humus produced by decayed vegetable matter, interspersed with much sand; receiving moisture in abundance with freedom, and parting with it again with certainty and dispatch.

If a soil is naturally too tenacious for Asparagus—and it must be borne in mind that in a clayey soil no cultivation will make it succeed—a few loads of lighter soil had better be procured for making the beds. If this be unattainable, the only resource is to reduce the tenacity of the soil by a large admixture of pulverized oyster-shells, bone-dust, and ashes.

We are glad to find that others conversant with the culture of this vegetable agree with us in our estimate of the importance of good drainage to this crop. Thus Mr. J. Cox says, whatever mode of planting be adopted, whether in single rows or beds, it should be remembered that the basis of success is a perfectly dry subsoil. Consequently, wherever the subsoil is not naturally a dry one, it is highly advisable to adopt some other means to lay it dry, in addition to the ordinary drainage, which should always be good. This has been done in a very effective manner, by removing the soil to a greater depth than is usually considered necessary, and placing a layer of blackthorn bushes at the bottom, which were covered with turfy sods not chopped, then a layer of strong manure, filled up with soil and manure alternately. The finest

Asparagus was produced from beds thus formed, and on a portion of them being removed three years after, the roots were found to have descended a perpendicular depth of five feet. (*Gard. Journ.* 1847, 52.)

Mr. Cox's plan, as here detailed, is indeed excellent, and, withal, economical. We would say to those who have small brushwood at hand, use it by all means on all occasions, less or more. Only, in clay soils, do not depend on small brushwood for permanent drainage. It will act tolerably, if not too small, for a year or two, but after awhile the smaller particles settle into a close humus, and tend to intercept the drainage.

Salt.—That this should be beneficial to Asparagus might be justly anticipated from the fact that it is a marine plant. Such anticipation many years since led to its sparing application to the Asparagus bed, but it is only within these few years that its abundant use has been ventured upon. What led to it was the accumulation of facts such as the following:—

By the inundations of the sea, at Friesland, in 1825, the oak, the mulberry, pear, peach, and others with deep roots, did not suffer; neither did the asparagus, onions, celery, &c., for they were never finer, or more luxuriant. But the vines and gooseberries contracted a salt taste; and the apricots, apples, cherries, elms, poplars, beech, willows, &c., could not bear the over dose of sea-water. They pushed out a few leaves, but speedily perished. (*Sharon Turner's History,* 117.)

Similar results were noticed, after an inundation of the sea, in the garden of the late talented Richard Gower, Esq. near Ipswich, in Suffolk, in November, 1824. In this instance a portion of the garden remained 24 hours under the sea water. The asparagus beds were materially improved in their produce. The cherry trees, in the following year, actually produced a numerous crop of cherries, which tasted, however, so very salt that they could not be eaten, although very fine in appearance. These trees all died in the following year, 1826.

The finest Asparagus, as we shall see in the next section, is grown in the north of Spain, in places intentionally and repeatedly covered by the flowing tide of the sea. We have for many years, and with unfailing benefit, sown salt thickly over our Asparagus beds, and if any one complains of their own being unproductive, we always inquire if they have had any liquid manure and salt? We, therefore, agree with Dr. Lindley, that undoubtedly salt is extremely beneficial to Asparagus; and that this plant will take a great deal of it, and be much the better for it, is equally certain. The same is true of sea-kale. Both are shore plants, and are abundantly fed with salt at all seasons. How much the largest quantity may be that they will endure is uncertain, but we have seen a pound of nitrate of soda given to one seakale-plant without the slightest injury, and it would no doubt have found no nconvenience from as much common salt; nevertheless, there are those who are unable to discover the utility of salt as a manure for Asparagus. The reason of this is well pointed out by Mr. Beaton. It is, he says, a general rule to cut off all weak shoots while the Asparagus beds are in bearing, or at least up to the beginning of June. Under such treatment the plants cannot be much benefited by whatever dressings the beds receive through the winter or spring, because all plants —the Asparagus among the rest—can only collect and digest their food and store away the product for the next growth, while they are in a growing state; and in all herbaceous plants like the Asparagus this store is laid up in the roots. Now, whatever may have tended to improve Asparagus must have been stored before the end of the autumn; and salt given to beds in March must go through a wonderful process, along with other agents, in the course of the summer, before it can be stored in the roots when the growing season is over, or tell upon the crop in the following May. These are simple facts, well known to the gardeners of the present day, but of which many of the last race of gardeners entertained strange notions, judging from their mode of loading their Asparagus-beds in winter with dungs and compost, a practice which is not yet got rid of, but which, compared with the improved system of feeding plants in summer, while they are in active growth, is a mere waste of time and materials; not that winter-dressing is lost on the plants altogether, although the best part of it is; but that if the same amount were given in summer in a liquid form, when the plants could at once appropriate it, the benefit would be out of comparison in favour of summer manuring, not only to Asparagus, but also to sea-kale and rhubarb. (*Gard. Chron.* 1843, 387.)

In the few cases in which salt has been said to be injurious, the beds have either been in bad condition as regards drainage, or it has been applied to beds newly formed, and therefore to plants with wounded roots, for such recently planted Asparagus must be considered to be, however carefully the plants may have been taken up. The same injurious effect might also be produced by the salt coming in contact with wounded portions of the plant, whether of the roots, in consequence of cutting the sides of the beds when throwing up the soil from the alleys, or of the crown, in cutting the shoots. A tree will be killed by the application of a quantity of salt to a cut root, although a much larger quantity might be given with impunity when the roots are in a sound state. Along with the salt some have used night-soil; liquid manure fixed and prepared with sulphuric acid; Potter's liquid guano, at the rate of half a pound per square yard, following the application by plenty of water. These have been all employed with marked advantage.

The quantity of salt that may be used is truly astonishing. We have tried it for the last three years, and approve of it much. Indeed the natural habits of this plant point at once to the propriety of a frequent application of salt. Mr. Beaton argues very ingeniously on this head, and his remarks are undoubtedly in the main correct. There is, however, such a thing as a pressure of business at certain periods in gardening, and any recipe to be generally useful must be simple. Therefore we would say, as a broad rule—seeing that salt is by no means a costly affair—give the beds a salting in November, in December, and again in January, in preference to a very heavy dressing all at once. This will no doubt infuse enough of the saline principle for the succeeding summer, and if liquid manures can be applied in July abundantly and during hot weather, so much the better. We have salted two years according to this plan, and it seems to us perfectly satisfactory.

It must be mentioned, however, that it is the opinion of the best cultivators, that in addition to these substances, Asparagus must have farm-yard manure, if it is to be grown well. This, says Dr. Lindley, is true, probably, in the case of heavy, or close land; but in loose friable soil must be unnecessary, for such soils do not require that their texture should be improved. (*Ibid.** 1846, 147.)

It is most probable, that the other salts contained in sea water, such as the sulphate of magnesia, chloride of calcium, and chloride of magnesium, are also very beneficial to the Asparagus. Hence manuring with *fresh* sea weed, and even watering with sea water, have been found more beneficial to Asparagus than the application of crystallized salt.

Thus a very good authority says, for many years I have known sea weed, and strong sea sand, taken wet from the receding tide, used as a dressing for Aspagus beds, and I never knew those beds to fail. Now the secret of this application is in the saline qualities of the weed and of the sand, and not in any substantial quality of the sea weed, for when that is dissolved there is nothing left for the earth of the beds

* With all deference to so high an authority we are of opinion that if size, amount of produce in the aggregate, and tenderness, be the points to aim at, farm-yard manure, especially if blended with ordinary vegetable matter or leaf soil, will exceed all other applications, either on clays or sands. We much doubt too the correctness of the opinion, that loose, friable soils do not require their texture to be improved. With regard to sandy soils, we are aware that they do not require any *consolidation*; they, however, require, mechanically speaking, something both to absorb moisture, and to transmit or equalise it afterwards, and this we would submit is one part of the office of rotten manures in sandy soils.

to feed upon. An attentive observer of the natural history of the Asparagus plant, cannot fail to discern the propriety of using saline manures in its growth; and the same treatment as to sea weed and sea sand applies to sea-kale. Both these plants are indigenous in Cornwall, and there is an island near the Lizard Point, called Asparagus island, on which that plant grows, and where I have frequently gathered it. In heavy gales of wind the sea breaks over the part of this island on which the Asparagus grows. The soil is sand, and loose decomposed vegetable substances. (*Gard. Chron.* 1844, 524.)

Another authority adds, that sea water is the best of all means of applying salt; because it is a vehicle for other substances, such, for instance, as chloride of magnesium, on which it is probable that the Asparagus feeds. We should water our beds with sea water during the whole of the season of growth, and also in the spring, just when the shoots are beginning to move. (*Ibid.* 1843, 577.)

If salt water be employed, we recommend a close imitation of that of the sea; using it as weak as it is found, usually, near the mouth of a river. This may be effected by dissolving two-and-a-half ounces of common salt and half an ounce of Epsom salts (sulphate of magnesia) in each gallon of water. This solution might be poured over the bed plentifully once a week.

If salt in a crystalline form is used, 2 lbs. per square yard may be put on thrice a year—in the middle of January, April, and in July, about a month after cutting has ceased. Let no one think this too much, for we have seen quite as much used for years with great advantage. This is not our experience alone, for we can add this testimony from a practical gardener in the east of England.

Long before any heads make their appearance, he forks in some manure from an old cucumber-bed, levels the surface, and completely covers the beds with fine salt, at least a quarter of an inch in thickness. If no rain falls for some time, he endeavours to wash it in by copious waterings, and even if there is rain in addition, as the salt is some time before it entirely disappears; the watering and the sun together often cause it to form a crust, which it takes some weeks to dissolve, and upon tasting the surface of the soil it may for weeks after be found very perceptibly salt. But what is the effect? Every weed is entirely destroyed, and the beds are as clean as a well-trodden turnpike-road. But the Asparagus! what becomes of that! that thrives, and improves in a remarkable manner. The writer is accustomed to see bundles of very fine heads from Ely and Wisbeach, which places are noted for excelling in the growth of this vegetable; but, he adds, that he never saw finer than his own, and all this alteration was caused in a few weeks in plants before almost valueless. (*Ibid.* 1842, 435.)

Dungs.—We are strongly in favour of employing the most stimulating and most readily decomposing, and we add early in every spring, usually in February, a heavy dressing of either night-soil or pig's dung, sprinkling a little earth and lime over it to remove any unpleasant appearance and effluvium. Some gardeners, of undoubted skill and experience, do not use dungs, but instead of them highly-decomposed leaf-mould. Thus—

Mr. Craggs, gardener to Sir T. D. Acland, Bart., has not put a barrow-load of dung on his beds for four years. In the summer months, he keeps the rubbish of the garden burning, preserving the ashes dry until autumn, and, as soon as the Asparagus is fit to cut down, he takes off half the soil above the crowns with a fork, laying it on the alleys; he then puts on three inches in thickness of burnt rubbish, running it through with a fork as near the crowns as possible without injuring them. He then takes a portion of the soil that has been removed, and covers the bed with it, allowing it to remain on them through the winter. Early in March he mixes the whole well together with a fork, and rakes the bed off regularly, watering with manure water once a week through the growing season, if required. (*Hort. Soc. Journ.* ii. 41.)

Another party uses both dung and decayed leaves, putting the former on in the spring and the latter in the autumn. His directions are as follow :—

Cover the beds with rotten dung, and let it remain on all the summer, which will keep the beds moist, and nourish the young plants. As soon as the stalks are decayed rake off the dung, and put on three or four inches of rotten leaves, such as have been used for forcing melons, pines, &c. The leaves will be much improved by having been exposed for some months, and turned over two or three times before they are put on the beds. Put a light covering of mould over them to prevent their being blown away by the wind. Apply leaves in the same way every autumn, until the mould becomes as deep as it is wanted above the roots of the plants, increasing the quantity laid on at once according to the strength of your plants. It will be necessary to have the paths covered with long dung or litter, to prevent their being trod too hard for the roots to run in. The paths should never be dug, as is usually done, nor even the beds dug with a prong, which is often done, much to the injury of the crowns. The leaf mould when decayed will be found sufficiently light for the plants to rise through without digging. Any vegetable mould will be found to answer well, particularly the mould of green vegetables. Holes and ditches in and adjoining woods generally abound with decayed leaves, which, if mixed with leaves that may be collected, or any useless litter, will soon become a large quantity of mould. (*Gard. Mag*. ii. 278.)

Potter's Guano may be applied at the rate of half a pound per square yard to Asparagus beds. It should be well diluted in water, and applied in portions weekly during the early part of summer, commencing immediately the cutting is over. (*Gard. Chron*. 1844, 656.)

Nitrate of Soda has been applied, it is said, with great advantage to Asparagus. It should be sown over the beds in May, and not more than 2 lbs. to every 16 square yards.

In casting a glance over preceding statements and opinions, and adding thereto our own opinion, founded on a practice of many years, we would suggest that the following points are perfectly established, viz., first, that a loose and friable soil is most congenial to this vegetable; secondly, that it should be rich in vegetable matter at least, if not of active manures; thirdly, that a very considerable depth is necessary, not less than two feet; and lastly, that this soil must be well drained. With regard to the last, it must be remembered that the Asparagus in the growing season loves moisture in great abundance, although it is impatient of stagnation. It remains, therefore, for some one to do justice to those principles which, after all, may be copied in the main from a well managed English water meadow—combining thorough drainage below with timely irrigations. The only thing necessary would be to infuse the saline principle: this is so easy that it needs no comment.

Before finishing this division of the subject, we would beg to impress on the inexperienced in its culture the propriety of using charred, or rather burnt, matters, in combination with salt and manures. Much and weighty testimony exists as to the utility of such applications; as to their economy, that requires no remarks. Hedge clippings, vegetable haulm, tree leaves, and weeds, may be put together and burnt for this purpose.

OPEN-GROUND CULTURE.

Beds.—Some of the precautions required in the construction of these have been incidentally noticed in the previous section, under the head "Soil." If the requisites for its staple and drainage, as there directed, are carefully provided, it is of very secondary consequence whether the beds, as usual, are raised above the level of the surrounding ground, or whether their surfaces are of equal height, as recommended by Mr. Beaton. In very stiff and retentive soils, however, and where the surface soil is of a shallow character, it will be well to keep rather above than below the ground level, for reasons previously given.

In ordinary cases it is well to keep the crowns of the plants at the ground level; if the soil is deep, dry, sandy, and hungry, it will be as well to keep a little below it.

With regard to the preparation of ground, it is a good plan to commence with peas, to be followed by celery. Appropriate a considerable plot for these, or, in other words, keep them together as much as possible, for the sake of system; and having an even number of rows, make it a rule to sow two at a time, at the distance of from four to five feet; and these, when picked, and the haulm cleared away, furnish space for a bed of celery of about the same width. The peas being removed, the ground is marked out for the celery-bed, after what is termed the Scotch method. The bed is now excavated to the depth of a foot, the soil thrown right and left, and made compact; and then six or eight inches of half-decayed leaves and dung, chiefly of the former, and which had been used as linings to pits or frames, is trenched in, at least a foot deep in the excavation. The surface is now covered once more with three inches of the best rotten manure, which, when spread, is forked in and duly mixed. The bed is then planted, and when taken up for use, the operation, with a little care, levels and leaves the bed right for planting the

Asparagus when the period arrives. (*Gard. Chron.* 1844, 667.)

Mr. Craggs, gardener to Sir T. D. Acland, Bart., gives the following directions for the selection and preparation of the ground for the beds :—

In selecting the ground for permanent beds, choose a piece free from trees, and sloping to the south if possible, giving a preference to a strong sandy loam, of the depth of three feet; and if not naturally so deep, making it that depth artificially. Take out a trench two feet six inches wide, and three feet deep; laying one-third of the soil on the vacant ground where you commence, and carrying the other to the place where you intend to finish. Suppose the trench to be now taken out, and the ground ready for trenching, lay over the whole surface six inches in depth of dung from old hotbeds, shaking it well with a fork. Turn in the first spit and crumb with a full-length spade into the bottom of the trench, mixing the dung and soil thoroughly together with a fork; then throw out the other soil, until the second trench is the same depth as the first; and so proceed until you come to the last trench, into which throw half the earth taken back, and add dung equal to that for the first spit, mixing it and the soil well together with a fork as before. Now that the ground has been once trenched over, and the bottom spit thoroughly mixed, tread the whole surface, and again lay on it about six inches in depth of dung, shaking it well as before. Then proceed to trench the ground back, leaving the bottom spit, that has been mixed with manure, unmolested. Proceed as before, after the first spit and crumb have been turned in; mix the dung and soil well together with a fork, which will be two-thirds of the trench mixed, throwing on the top the remainder of the earth unmixed with dung, until you come to the first spit that has been mixed, and so continue until the ground has been all trenched a second time; then throw in the earth laid out at the commencement of the trenching, adding dung equal to that for the spit just thrown in, and well mixing it with the soil. There will now be an opening at the top, and one-third of the earth left at the bottom. Tread the whole surface over, and again lay on six inches in depth of dung, forking up the hill, and keeping the same opening. The whole mass of earth and dung will then be thoroughly mixed from bottom to top, and the opening will take the remainder of the earth thrown out of the first trench. The work should be done in dry (not frosty) weather—say in October. The ground being thus prepared, throw it up in rough spits, one spade deep, to be pulverized by the frost against planting time. (*Hort. Soc. Journ.* ii. 39.)

In laying out the beds they may be made two feet wide, with a single row of plants down the centre, or three feet wide, with two rows, 18 inches apart. The latter we prefer, because it secures economy of ground, as well as facility of weeding, and other after-culture, without the necessity for treading upon the beds, which is always to be avoided. The only advantage of beds, two feet wide, is that they are more convenient if the Danish mode of forcing, described in the next section, is adopted.

Alleys, or trenches, between the beds, are necessary to prevent the necessity for treading upon the beds, as well as to enable the roots of the plants to be earlier stimulated by sun-heat in the season; and when it is wanted early that is of importance; sometimes, also, they are used for irrigating, or for receiving stable-litter for forcing. For the sake of free exposure to the rays of the sun, the beds should always range north and south.

Beds level with surface.—Mr. Beaton, the excellent gardener at Sir W. Middleton's, Shrubland-park, near Ipswich, says, that—

By far the best way of growing Asparagus is, in single rows, 3 ft. apart, and 9 inches plant from plant; but if the ground is not deeper than 2 ft. or 30 in., or if room is scarce, the rows need not be more than 30 inches asunder.

Mr. Beaton says, he has grown Asparagus this way for the last 15 years, and given them no dung in winter, merely clearing off the stalks and weeds in

October, and pointing over the surface, about 2 in. deep with a fork, and leaving it as rough as possible. Early in March, when the surface is quite dry, it is raked down, and about 2 inches of soil drawn over the crowns from each side of the rows, which gives the ground something of the appearance of a plot of peas earthed up for the first time; when the gathering is nearly over, the ground is stirred again to loosen the trampling made in gathering the crop. The hollow between the little ridges is then filled up with a powerful compost, consisting of equal portions of sandy soil, leaf mould, and pigeon's dung; the whole is then drenched with liquid manure from the stables, cowhouses, or laundry, and the foreman of the kitchen garden gets *carte blanche* to water the Asparagus any day through the growing season, when he can best spare his men, or, at all events, every fortnight, and always with liquid manure, if possible; as to the quantity of water, the only instruction he gets is, that he cannot drown them. This is cultivating the Asparagus in summer. In very dry seasons, it is of great advantage to mulch in between the rows with short grass, or any litter. Some have an idea that the frost should be kept from Asparagus, and go to some trouble to do so, but it is in reality as hardy as the oak, or any other of our native plants. (*Gard. Chron.* 1843, 387.) So far is Mr. Coulam, of Louth, in Lincolnshire, from thinking Asparagus requires shelter whilst in a state of rest, that he recommends it to be especially exposed to the cold. He says that—

The best treatment is to cut down the tops to nine or twelve inches above the ground, and to fork over the beds in November between the rows, and to lay the crowns bare, for the frost to act upon, by turning the soil into the walks, there to remain during winter. As soon as the frost breaks up, return the soil out of the walks to the beds, which will be good and rich; then fill up the walks only with good manure, and dig it into them to be in readiness for another year, and it will cause the outside rows to push the shoots a week or two before the centre of the bed, and it makes a succession. The frost will not injure the roots of either Asparagus or Rhubarb; it invigorates and makes them grow stronger. Mr. Coulam says that the stalks of his Asparagus, thus treated, are from 7 to 9 feet in height—more like young Larch Firs than Asparagus. In returning the soil from the walks in the spring, add salt mixed up with the fine pulverized soil before returning it to the beds. (*Gard. Chron.* 1845, 836.)

We happen to know, by experience, that Asparagus may be cultivated in a first-rate way by the single row system, as detailed by Mr. Beaton. This was a favourite hobby with ourselves for a few years. We, however, find that double rows, under a good system of cultivation, are more productive on a given amount of land. We are sorry to differ with so respectable an authority as Mr. Beaton about the liability of injury from frost to this plant. We have twice or thrice suffered from it; generally, however, in soils that were either naturally retentive of moisture, or had become what gardeners term "soddened." We took up some roots in the early part of January of this year, to force: part were put in the frame over night; the remainder were frozen so hard that we thought it prudent to let them remain for a day or two. We therefore covered them with a little soil and some litter, and they lay for a fortnight after. A thaw ensuing, we took the first opportunity of introducing them to their partners. Very different, however, has been the success of the two portions. The first were strong, and vegetated quickly; the second were singularly tardy, and when they budded their shoots were few and weak.

Extent of Beds.—The quantity of ground sown or planted, even in the smallest garden, should not be less than a rod, as it requires that extent of plantation to produce a single good dish. For a large family, one-eighth of an acre will be requisite; but five poles, planted with 1600 plants, will yield from six to eight score heads daily for a month. A crop from seed will allow of one stalk from each plant being gathered the third spring, two stalks the fourth spring, and three or more the fifth; while a plantation of two-year-old plants, transplanted, will allow of one stalk being cut from each plant the second spring, two the third, and so on.

For a moderate sized family, beds extending over from 140 to 200 square yards, and containing from 700 too 1000 plants, will yield a sufficient supply throughout the season.

An Asparagus bed formed of a genial soil, and properly drained and managed, will continue in plentiful production for thirty years. If the beds are of sufficient extent to allow of their being cut from only once in two years, they will make bountiful returns for a century or more. (*Cal. Hort. Mem.* ii. 250.)

It may here be remaked, that the amount of ground under Asparagus must ever depend on two important circumstances, viz., the quantity and frequency of the cuttings, and whether the forcing of Asparagus is carried to much extent. To this a third consideration may receive some attention; and this is, whether, for the sake of any fine "grass," the proprietor is willing to adopt the resting system, which is proved, by both science and practice, to be perfectly correct. The great longevity of Asparagus, alluded to here, will be found tolerably correct, providing the beds are originally established on good principles; that cutting does not commence too soon; and that a system is followed up of giving the beds in succession a rest every third year; that is, cutting two years, and totally resting the third.

Mode of planting.—The plants being taken from the seed-bed carefully with a narrow-pronged dung-fork, with as little injury to the roots as possible, they must be laid separately and evenly together, for the sake of convenience whilst planting, the roots being apt to entangle and cause much trouble and injury in parting them. They should be exposed as short a time as possible to the air, and to this end it is advisable to keep them until planted in a basket covered with a little sand. The mode of planting is to form drills or narrow trenches five or six inches deep and a foot apart, cut out with the spade, the line side of each drill being made perpendicular, and against this the plants are to be placed, with their crowns two inches below the surface, and twelve inches asunder.* The roots must be spread out wide in the form of a fan, a little earth being drawn over each to retain it in its position whilst the row is proceeded with. For the sake of convenience, one drill should be made at a time, and the plants inserted and covered completely before another is commenced. When the planting is completed the bed is to be lightly raked over, and its

* We do not know the greatest depth at which Asparagus may be buried with impunity, but the deeper it is placed from the surface the later will it vegetate in the spring. The crowns never rise nearer to the surface.

outline distinctly marked out. Care must be had never to tread on the beds—they are formed narrow to render it unnecessary—for everything tending to consolidate them is injurious, as, from the length of time they have to continue, without a possibility of stirring them to any considerable depth, they have a natural tendency to have a closer texture than is beneficial to vegetation. Water must be given in dry weather daily until the plants are established.

Another and most excellent plan, adopted by Mr. Errington, is as follows:—

In planting, the beds are to be set out for two rows each, the rows two feet apart, with an alley of four feet between them. The line being stretched precisely where the Asparagus is to be, make a slanting cut sloping from the line, about nine inches deep, and the soil thrown out as in forming an edge for box; the same cut is to be made on the opposite side of the line, leaving a sharp and angular ridge, across which the plants are set astride; the operator taking half the roots in the one hand and half in the other, divides them across the ridge, at the distance of ten inches between plant and plant. Previous to planting, however, some fine highly decomposed vegetable matter is to be placed up the line, in contact with the roots, and pressed firm; the roots are slightly tipped, and dipped in a puddle of thick dung water. The plants should be at least two years old, for it is a waste of ground to plant earlier, unless in case of emergency. The young plant must be watered every morning for a week, unless rainy. The only treatment necessary the first year, at least through the growing season, is to keep them perfectly free from weeds. If any crop is planted between them, it should be a row of Coleworts from a June sowing, which would make their growth chiefly after the Asparagus had done its best. In November, the ground is to be dressed with good rotten manure, and in spring the alleys are thrown over the manure, just deep enough to cover it. No cropping can now be carried on between the rows, although a good crop of Cauliflowers may be grown in the alleys. The next point is the mode of dressing pursued in the autumn of the second year. It is of much more importance to feed the Asparagus at the extremities of the roots in the alleys, than over the crown: good cultivators of it, in brick pits, do not allow the alleys, after forcing, to remain empty all the summer; they are filled with good rotten manures, and any one who has witnessed the emptying of these alleys in autumn, preparatory to forcing, must have been struck with the abundance of strong white roots, of which such alleys are full, and which are annually (it may be) cut off. Such roots can scarcely be produced from the crown; and it occurred to Mr. Errington some years ago, that the alley, above all, should be well attended to with manure. He, therefore, in November of each year, as soon as the ground is cleared of dead stalks and weeds, causes all the loosest of the soil to be drawn off the beds with a rake; the bed is then well dressed with very rotten manure, and left for the winter. In February the alleys are dressed about from six to nine inches thick, with half-rotten manure and leaves, from partially decayed linings, which is trenched down very deep, and the bed is then soiled, over the manure, to the depth of four inches, with fresh soil from the alleys. This completes the whole course of culture. Finding the plants much injured by winds, in the growing season, lines of cord are run up the principle rows, to support the stems. (*Gard. Chron.* 1844, 667.)

The foregoing detail of cultivation, as practised by ourselves up to the year 1844, has been continued up to the present time with little deviation. Few obtain a greater amount of success; few have paid more attention to the cultivation of this delicious vegetable for many years. We may here be permitted, perhaps, to repeat, that we lay the utmost stress on the due cultivation of the alleys. Mr. Beaton calls his liquid manuring and application of saline matters, "Summer cultivation;" we beg to lay claim to this title also, in common with Mr. Beaton, for our alley cultivation. Whatever mode be adopted, we would beg to remind Asparagus growers of the great vital powers possessed by the old Asparagus roots, even if cut asunder by the spade. The stump will, if proper facilities be afforded, again push forth gross roots, with all the vigour of youth, and this circumstance led us some years since to pay a great amount of attention to the cultivation of the alleys.

It is of very great importance for the ensuring of success in the planting of Asparagus, to lift the roots carefully, and to expose them to the air as short time as possible. No plant feels a hurt in the root more keenly than Asparagus; the fibrils are very brittle, and if broken, do not readily shoot again. (*Nicol's Gard. Kalendar*, 47.)

With regard to the distance at which Asparagus should be planted, we have already expressed our opinion upon the importance of having wide intervals between the rows and between the beds, to admit freely the light and the air, but we will fortify our recommendation with the authority of two other experienced gardeners, who recommend even wider intervals than we have adopted.

Mr. J. Wighton, gardener at Cossey Hall, says that, to raise large Asparagus, the soil should be made good to the depth of 5 or 6 feet; then laid out in beds from 4 to 6 feet wide, with paths between them of the width of 2½ feet. The plants must be put in 2 feet apart, and the stems not allowed to approach each other nearer than 2 feet; or beds 3 feet wide, with one row of plants down the centre, and the plants $1\frac{1}{2}$ feet asunder in the rows, would be preferable. It is a very common error to allow too many stalks to grow close to each other. If this be permitted, however good the soil, the Asparagus is sure to be small; as the stalks, when so close, draw upon each other. Weak and small stems produce invariably weak Asparagus; for it is at the bottom of these that the Asparagus springs. (*Gard. Mag.* 1837, 358.)

Mr. W. Dickson, of Redbraes, near Edinburgh, recommends the rows to be three feet and a half apart, and the plants nine inches from each other; observing, that the produce will be much stronger than that from plants crowded together in beds; and he reckons that two rows, planted as described, will produce more than three rows planted in beds in the usual way. (*Trans. Hort. Soc.* vi.)

Time for planting.—It is usually recommended to plant in March, but recent experience demonstrates that April, May, and even June, are preferable months. Some orchises, and other fleshy rooted plants, can only be moved successfully whilst vegetation is active. This is the case, too, with Asparagus. Every one must have suffered from failures in March planting, but if the planting be in May, these very rarely occur. Mr. G. Fleming, the highly skilful gardener at Trentham Hall, observes that—It may appear that Asparagus planted in March, and having the whole season to grow in, must have a better chance of doing well than that which is transplanted in the middle of its growth; but it is evident, that whatever advantages may arise from early planting, are counterbalanced by the ground being cold and wet, and the roots of the plants being so tender that many of them perish before the vegetable principle is excited; while at a later period the case is different, as the juices of the plant are in motion at the time, and the soil being in a warm and genial state, is prepared to encourage immediate growth. Mr. Fleming has planted repeatedly, and most successfully, in the beginning of June. (*Gard. Chron.* 1844, 276.)

Mr. Errington invariably plants in May, or, in fact, when the Asparagus is what the market-gardeners term "in feather," that is, about six inches high. He finds, by many years' experience, this is the best time; and, perhaps, one of the best proofs of it is, that he seldom or never loses a plant.

After the round of two more years, we beg to recommend late spring planting; that is to say, April or May; or rather when the "grass" is about six inches high and beginning to "feather." This, we believe, is the most general practice of the market gardeners in the neighbourhood of the metropolis; or, at least, we once heard Mr. Cock, of Chiswick, declare it to be so. Nevertheless, to be successful, it must not be done at this period in a neglectful way.

We still pursue the same course of practice as that detailed in the *Gard. Chron.* 667, 1844; if we have differed in any thing, it is in making a more liberal use of salt. The Asparagus, after planting, must be attended to with water daily; if dry, for one fortnight after planting; after which it may be left safely to itself. A good coating of half rotten mulch, three inches thick, should be laid over the soil: this will break the action of the water, and thereby prevent puddling of the surface. Towards the end of July the young plants will throw up a second shoot of a much stronger character than the original one: this should be soiled up a little, when half a yard in height, to prevent wind waving.

We may remark here, that Oulton Park Gardens are celebrated for their produce of fine Asparagus, and it is gratifying to know that another very successful cultivator of this esculent, Mr. Craggs, gardener to Sir T. D. Acland, Bart., adopts a similar rule as his guide to planting time. He says:—

Plant when the stems have grown about an inch above the ground in the seed bed, choosing a dry day, when the soil will work freely. After having marked out the beds four feet in width, and having allowed two feet for the alleys, strain a garden line on each side, and with a rake draw the soil equally off the bed into the alleys, about two inches and a half deep. Then strain the line exactly through the middle of the bed, and with the point of a dibble make light marks one foot six inches apart. That being done, then strain the lines nine inches from the margins of the bed, being a distance of one foot three inches from the middle row to the outside ones. These mark in the same way as the middle one; but so that the plants will not be opposite each other. Every thing being now ready, plants are taken from the seed bed, selecting the finest, and exposing them as little as possible to sun and air. Place one plant over each mark made in the bed, spreading the roots out as regularly as possible on the surface, and laying a little soil with the hand from the alleys on the plants, in order to fix them in their places. The bed being planted, strain the lines on the outside, and with a spade throw the soil from the alleys over the crowns, covering them about an inch and a half, but not deeper. If any burnt vegetable matter can be obtained from the rubbish heap, coat the beds over, about half an inch in depth, with it, after they have been planted. In autumn, when the stalks are ripe, cut them down close, and clean off the beds, taking care not to disturb the soil, the crowns being so near the surface. Make a mixture of equal parts rotten dung and burnt garden rubbish, and coat the beds with it three inches in thickness, just covering it with soil from the alleys. In this state allow them to remain during winter, and early in March run it through with a fork down to the level of the bed when covered. (*Hort. Soc. Journ.* ii. 40.)

Autumn Dressing.—During the whole summer the beds must be kept well hand-weeded, and during that time and in spring we quite agree with those who recommend the plants should be supplied with manure abundantly. Yet we are quite sure that autumn-manuring ought not to be dispensed with, for, from actual experiment, we know that beds alike almost surfeited with liquid manure during the summer, and similarly dressed in the spring, yielded much less from that half of them which was allowed to remain without the addition of any fertilizers in the autumn. At the close of October or early in November the stalks must be cut down and cleared away, and the weeds hoed off into the paths, care being taken not to commence whilst the stems are at all green, for if they are cut down whilst in a vegetating state the roots are very prone to shoot again, and consequently are proportionably weakened. The dung we employ is that of the pig, mixed with straw and well decomposed. We sprinkle a little earth over this manure, but leave that in the alleys quite untouched except by the hoe.

Spring Dressing.—In February or March, early in proportion to the mildness of the season, slightly scarify the surface of the beds with a fork, and give them a coating of night-soil, or pig dung, three or four inches thick. But directions for doing this will be found in the previous section on "Soil and Manures." Before the shoots make their appearance, in the course of April, a slight layer of leaves, two or three inches thick, may be beneficially added. They may be kept from scattering before the wind by a sprinkling over them of earth. These spring dressings afford protection to the young shoots, as well as most desired nutriment; for, as Mr. Cramb, gardener, at Heywood House, Westbury, justly observes, although by some it may be argued that Asparagus is as hardy as any other marine plant which inhabits our sea-coast, yet it must be remembered that, when subjected to artificial cultivation, its primitive character is changed by the application of manure, which enlarges the vegetable tissue, and consequently it is less able to resist the effects of cold. (*Gard. Chron.* 1843, 589.)

Renovating Old Beds.—The following excellent mode is recommended by Mr. D. Robertson, of Walkenshaw, N.B.:—

Lift the surface clean off the crown of the plant, and from between the rows; take away from six to nine inches of the old soil, or at least as much as can be conveniently without injuring the plants. The vacuities thus made, fill up with a prepared compost of ashes and rotten leaves, and about the rows let this compost stand about four inches thick when the operation is finished. On the approach of severe winter weather, cover up the quarter with stable dung, and over the covering frequently, during winter, pour as much of the drainings of the dunghill as you can collect.

The top dressing compost might be thus composed: one-fourth sandy peat moss, from the surface of a dry heath; one-fourth furnace ashes, well sifted; and one-fourth vegetable mould, formed from tree leaves; one-fourth well-rotted stable dung, with a small portion of quicklime, all well mixed and prepared. (*Cal. Hort. Mem.* iv. 479.)

Taking the Crop.—This is usually practised without any judgment. The practice most frequently in use in the country, is to leave from the first the weak shoots, which some gardeners say encourage the growth of other shoots without distressing the plant, the shoot left being so weak. These shoots are to be found in the strongest and best Asparagus beds, and if cut, would not be considered worth dressing for a gentleman's table. Another practice, and that more frequently in use in the neighbourhood of London and large towns, is to cut everything away that appears, stout and weak shoots, until a certain day, and then leave off and never cut a stick afterwards. (*Gard. Chron.* 1842, 302.) We have found that a system intermediate these two is by far the most desirable. It is as follows :—

After cutting about twice in the spring, leave one stout shoot to each stool, with the intention of promoting the fibrous action of the root. As for the rest, cut all that are of any size until about the end of May, when cease cutting a bed or beds of the prime, which now suffer to grow for the earliest produce in the following spring, continuing to cut from the rest until about the end of June. (*Gard. Chron.* 1844, 668.)

The reasons for this and other judicious treatment of the Asparagus at the same season have been so ably enforced by Dr. Lindley and Mr. Beaton, and the practices are so important for the successful cultivation of this vegetable, that we shall give their observations fully, without any fear of sacrificing to them too much space.

You cannot have fruit, says Dr. Lindley, without leaves; and the more abundant the leaves are, provided they are all fully exposed to light and air, the larger and more excellent will be a crop of fruit, within certain limits. But if it is thus true of fruit, it is absolutely true of sprouts, such as those which the Asparagus plant produces; and the reverse of the proposition is equally unexceptionable; that is to say, the fewer leaves are left upon a plant, the more feeble will be its sprouts. To push the illustration to its utmost limits, we may add that the destruction of the leaves is eventually the destruction of the plant. Those thread-like bodies which clothe the stems of the Asparagus in summer-time act as its leaves, and are incessantly engaged in robbing air and earth of the matter out of which future sprouts are to be formed. That matter the stems convey down into the roots, where it is stored up till it is wanted. The more stems clothed with leaves, the more of such matter, and, consequently, the stronger the sprouts in the succeeding season ; and *vice versa*. If the summer shoots of Asparagus are strong, it is impossible that the sprouts should be weak; if the summer shoots are weak, it is impossible that the sprouts should be strong. These are facts about which there can be no mistake; but we fear they are far from being always sufficiently considered. We know very well that, in practice, gardeners will continue to cut sprout after sprout of Asparagus, until the roots are so much weakened, that the latter shoots, which are allowed to grow, are thin, feeble, and evidently struggling with exhaustion. Such debilitated shoots can do little for the roots during the summer, they can barely maintain their own existence, and are, consequently, preparing no new matter out of which sprouts can be formed the succeeding spring, when the crop is, therefore, necessarily weak and worthless. The conclusion to be drawn from this is obvious. No one should cut too many sprouts from his Asparagus bed; no one should remove limb after limb of his plants, untill they produce nothing but what is too small for table. On the contrary, the gardener should take care to leave at least two or three strong sprouts to grow from every root; or, which is better, his beds should be rested one year, and cut another; for he may be certain, from the strength of the summer shoots, what sort of sprouts he will have to cut the succeeding year—remembering always that it is useless to manure Asparagus beds for sprouts independently of summer shoots. If a bed of Asparagus is weak, manure in the autumn will do but little for making it bring strong sprouts the next season. All that the manure can then do is to feed abundantly the summer shoots of the succeeding summer, and so enable them to prepare plenty of materials out of which a second season's strong sprouts may be pushed forth. What is true of Asparagus is equally true of Sea-kale and Rhubarb. (*Ibid.* 1842, 283.)

Mr. Beaton, arguing similarly, says, you may lay down as a rule having no exception, that if your beds have not a vigorous growth in the summer, you will look in vain for fine Asparagus in spring. As the succulent shoots proceed from the buried root, their size must be in direct proportion to the healthfulness of that root, or to the quantity of organisable matter that root has stored up. How, then, can the root be brought into a proper state for producing large shoots? By giving every advantage to the plant during the summer and autumn; so that if your beds this summer are covered with a tall and strong vegetation, the abundance of solar light, &c., will convey a proper supply of matter to the root for next season, and you will cut fine Asparagus; but, on the other hand, if there appears only a stunted and weak growth, your produce will be small. If the principle just laid down is correct, the mode of treatment must consist in judicious cutting, and the application of proper manure. If from any cause the shoots appear thin and spindling, do not cut them at all, but let the bed have a rest during a whole season. The next spring the advantage will be manifest. Nothing would tend more to bring exhausted beds round than this generous treatment, and by the sacrifice of a few dishes now you will secure an abundance next year. What is true of a whole bed applies also to individual plants. Always leave the weak shoots in the beds, on the presumption that by cutting them they will become weaker, but that they will make robust shoots by being allowed to grow and bask in the air and the sun. These remarks also lead to another practical conclusion—to leave off cutting in time. Fine shoots must not be looked at with a longing eye, as though it were waste to let them run to branches and flowers.

They are the parents of a future race, and ought to be kindly and respectably treated. Manure must be plentifully given in conjunction with the above mode of treatment. It should be applied at such times that the growing plant may receive the benefit. It is possible for a top-dressing put on in autumn to have all its valuable properties washed below the reach of the roots, before they begin to exercise their vital powers. However, cover the beds with good dung in autumn, but do not neglect to furnish a fresh supply in spring. Salt and liquid manure should be used at the latter period, as they become immediately available. In April cover them with salt, so that on a dry day the whole surface looks as though it had been snowing; then water with about 60 gallons of liquid manure saved from a stable during the winter. If you have not liquid manure, make some by diluting good stable dung with soap-suds, &c. As the roots will soon begin to move, the soil will be furnished with those materials which will ensure a quick and strong growth, and, if the beds were healthy last year, you may depend on a crop. *(Ibid.* 1846, 204.)

The foregoing remarks by Dr. Lindley and Mr. Beaton are so excellent, that farther comment is almost superfluous. We would here, however, again urge the necessity of rest, before adverted to, providing durability is aimed at. Notwithstanding, where much Asparagus is required for forcing, and one or two beds are required to be taken up each year for this purpose, this kind of rest will become less necessary; in fact, the beds may be cut rather close for about three years from the commencement of cutting, and then rest entirely one summer. In the ensuing winter such beds will be found in very good condition for forcing. This is our own practice, and we see no reason to depart from it. We force two beds each winter, and plant two fresh ones in lieu thereof. The two fresh beds invariably succeed two celery beds prepared in the Scotch manner, viz., six feet in width. These are prepared of double the depth usual for celery; the bottom of it containing much vegetable matter in a somewhat raw state, the richer and more decomposed manure being kept nearer the surface. We have a double aim in pursuing this practice; in the first place we secure a constant succession of what is termed "maiden" grass, which is always very full flavoured; and in the second, which, in a general scheme of cropping, we consider more important still, some excellent and fresh ground comes to hand annually, for any of the Brassica tribes, for which, from their number, variety, and frequent repetition in kitchen garden, it is always a matter of great difficulty to find room.

The Asparagus shoots are either cut for use, either with saw or chisel-edged knives, or they are broken off with the finger and thumb. If due care be exercised, the knife is the best mode, for it least disturbs the roots, and less liability of injury occurs than does by having to uncover the shoot and to thrust the thumb and finger into the soil.

In May the beds are in full production of young shoots, which, when from two to five inches high, are fit for cutting, and as long as the head continues compact and firm. Care must be taken in cutting not to injure those buds which are generally rising from the same root in various grades of successional growth within the ground. The knife ought to be narrow pointed, the blade about nine inches in length, and saw-edged, as thus represented. The earth being care-

fully opened round the shoot, to observe whether any others are arising, the blade is to be gently slipped along the stalk until it reaches its extremity, where the cut is to be made in a slanting direction. It almost always occurs that the same stool produces a greater number of small heads than large ones, but the latter only should be cut; for, the oftener the former are removed, the more numerous will they be produced, and the stools will sooner become exhausted.

If the beds be sufficiently large to furnish a supply, the Asparagus shoots should be cut as fast as they appear, otherwise they must be left till the quantity required has pushed forth, in which case, the variety in colour and size prevents them from having so agreeable an appearance. Another knife, of the shape here represented, is often used for this purpose. In cutting,

this knife is to be slipped along the stem, till it reaches the bottom of the shoot, where the cut, as with a chisel, is to be made. The cutting should cease about the end of June. (*Cal. Hort. Mem.* ii. 249.)

In French Flanders, they only use the hand in gathering the shoots. They partially uncover the plants, and break off the Asparagus shoots near the root. Many advantages are said by the Flemings to attend this method: the work-people do not run the risk of cutting the heads of one or more shoots which are not yet come to the surface of the earth; or of wounding the buds of the roots, which are apt to perish when damaged by the point of the knife. This way of gathering has been found also more expeditious: besides, thus moving the earth round the plant keeps it lighter, and lets in more easily to the roots the dew, the rain, and the heat of the sun, which tend to produce larger Asparagus, and in a greater abundance. They break all the Asparagus shoots in the following manner: when the shoot has been thoroughly uncovered by the hand, they lay hold of it, advancing the first finger and the thumb to the root, and break it easily from the eye or the joint of the root, which is immediately covered again with the same earth. (*Ibid.* iii. 423.)

Picking off the Berries.—From the stems that are allowed to grow up, and of which it is the allotted office to elaborate and store up organizable matter in the roots ready for next year's growth, it is a good practice either to pick off the berries, or, still better, to rub off the blossom, as soon as it appears. Every berry is formed at the expense of that organizable matter, and consequently impairs the next year's productiveness.

Blanching the Shoots.—In some parts of France it has been said that the shoots of Asparagus are improved in size and quality by being inserted within an inverted green-glass bottle, but this does not even partially succeed in England, except when the Asparagus is grown in a hotbed. When forced, if the light were totally excluded from a shoot, effects similar to those obtained in France would probably ensue, for we find that in Ireland they insert tin tubes over the heads, and thus obtain very fine ones. These tubes, of course, neither have narrow necks nor admit the light. (*Gard. Chron.* 1842, 471.)

To obtain Seed.—Some shoots should be marked and left in early spring; for those which are allowed to run up after the season of cutting is over, are seldom forward enough to ripen their seeds perfectly. In choosing the shoots for this purpose, those only must be marked which are the finest, roundest, and have the closest heads; those having quick opening heads, or are small or flat, are never to be left. More are to be selected than would be necessary if each stem would assuredly be fruitful; but as some of them only bear male or unproductive blossoms, that contingency must be allowed for. Each chosen shoot must be fastened to a stake which, by keeping it in its natural position, enables the seed to ripen more perfectly.

Foreign Modes of Culture.—In some parts of France, Flanders, and Spain, Asparagus is commonly grown of a quality and size attained only in rare instances in England. We shall append, therefore, some particulars of the cultivation adopted in those countries, especially recommending for as close imitation as possible the Spanish mode, for it has been partially pursued in this country and with very great success.

At the mouth of the Urumea in Spain, is a narrow slip of land, about three feet above high water mark, consisting of alluvial soil and the wearing away of sandstone hills, at whose feet it is placed. This is the Asparagus ground of St. Sebastian. Beds are formed five feet wide, without any previous preparation, except digging and raking. In March the seed is sown in two drills, about two inches deep, and 18 inches from the alleys, thus leaving a space of two feet between the drills. The rows run invariably east and west, doubtless in order that the plants may shade the ground during the heats of summer.* When the seedlings are about six inches high, they are thinned to something more than a foot apart. Water is conducted once a day among the alleys and over the beds, so as to give these seedlings an abundant and constant supply of fluid during the season of their growth. This is the cultivation during the first year. The second year, in the month of March, the beds are covered with three or four inches of fresh night-soil from the reservoirs of the town; it remains on them during the summer, and is lightly dug in during the succeeding autumn; the operation of irrigation being continued as during the first season. This excessive stimulus, and the abundant room the plants have to grow in, must necessarily make them extremely vigorous, and prepare them for the production of gigantic sprouts. In the third spring, the Asparagus is fit to cut. Doubtless all its energies are developed by the digging in of the manure in the autumn of the second year; and when it does begin to sprout, it finds its roots in contact with a soil of inexhaustible fertility. Previously, however,

* Spain is hotter than England; therefore, here the rows should range north and south.

to the cutting, each bed is covered in the course of March very lightly with dead leaves, to the depth of about eight inches; and the cutting does not commence till the plants peep through this covering, when it is carefully removed from the stems, in order that the finest only may be cut, which are rendered white by their leafy covering, and succulent by the excessive richness of the soil. In the autumn of the third year, after the first cutting, the leaves are removed, and the beds are again dressed with fresh night-soil as before; and these operations are repeated year after year. In addition to this, the beds are half under salt water annually at spring tides. Let any one compare this mode of culture with ours, and there will be no room for wondering at the difference in the result. The Spaniards use a light, sandy soil; we are content with any thing short of clay. They irrigate; we trust to our rainy climate. They know the value of salt water to a sea-coast plant; we take no means to imitate nature in this respect. They dress their beds with the most powerful of all manures; we are contented with the black residuum of a cucumber frame, which is comparatively a *caput mortuum*. Finally, they throw leaves lightly over their beds, by which means they expose the young sprouts to the least amount of resistance, and force them onward by the warmth collected from the sun by such beds of leaves; we, on the other hand, compel the Asparagus to struggle through solid earth, capable in the smallest possible degree of absorbing warmth during the day; but, on the other hand, ready to part with its heat again at night to the greatest possible amount. Can any one wonder, then, at the poor results obtained by our manner of cultivation? or that some gardener should now and then astonish his neighbours by producing Asparagus which we call giant, but which at St. Sebastian would be called second-rate? (*Gard. Chron.* 1842, 187.)

The culture of Asparagus at St. Sebastion is exceedingly interesting to the lover of progress, as throwing light on the use of rotten leaves, highly stimulating manures, and saline matters. It must be remembered, however, that a much greater demand exists on the plant in the way of perspiration in this part of Spain than in Britain. It may be noticed, also, that the application of salt water only takes place at spring tide; this will show that we northmen may apply salt without any danger either during or at the conclusion of the rest season.

The covering of leaf soil for the sprouts to come through is a most judicious proceeding; and, moreover, an advantage which any amateur in a small way may avail himself of, by collecting in due time the rakings of his shrubbery or lawn, short grass mowings, very old and spent tan, and suchlike matters, preparatory to the spring dressing. Such at

St. Sebastian must be very useful as a mulching; or, in other words, it will ward off part of the intense sunshine.

At Marchienne, in French Flanders, particularly noted for fine Asparagus, the plants are inserted two feet and a half distant from each other, at one foot from the edge of the bed, in the quincunx order. The roots are covered an inch thick with earth, on which are laid two inches of dung, or good hot-bed soil; and at last two inches more of mould. That the earth may not be unequally pressed, or partially condensed, a slight board is used for treading on. During the two first years after planting, the shoots should not be gathered for use, that the plants may gain strength; for should a single shoot be cut during that interval, it would materially hurt the plant, not only in preventing its acquiring its natural size, but also in shortening its duration. A bed well managed may last at least from twenty-five to thirty years. In the two first years the plants must be uncovered, about the end of November, down to the bud or top of the shoot, and covered again with five or six inches of good rotten dung, and left so till the month of April. The earth taken out in November, which has remained, during the whole winter, on the sides of the bed, and has been of course improved by the action of the atmosphere, is to be thrown over the plants again in April, to the depth of six inches.

After these two first, and during the following years, the beds are likewise uncovered every year in October, and immediately after Easter they are covered again, with at least a foot of good well sifted mould, that the Asparagus shoots may grow longer. It seldom happens that the plants fail when thus managed, and when the dung, before the planting, has been well and equally trodden in; but should this be the case, they may be replaced by others, which must be treated in the same way as above directed. (*Cal. Hort. Mem.* iii. 421.)

About Nice and other parts of France, where Asparagus culture is very successfully practised, Dr. Macculloch informs us that the following is the system of culture:—

The quarter must be divided into beds five feet wide, by paths constructed of turf, two feet in breadth and one foot in thickness. The Asparagus must be planted about the end of March eighteen inches asunder. In planting them, the bud, or top of the shoot, is to be placed at the depth of an inch and a half in the ground, while the roots must be spread out as wide as possible, in the form of an umbrella. A small bit of stick mnst be placed as a mark at each plant, as it is laid in the ground. As soon as the earth is settled and dry, a spadeful of fine sand is to be thrown on each plant, in the form of a molehill. If the Asparagus plants should have begun to shoot before their transplantation, the young shoots should be cut off, and the planting will, with these precautions, be equally successful, though it should be performed in this country even as late as July. Should any of the plants originally inserted have died, they also may be replaced at this season. The plants ought to be two years old when they are transplanted; they will even take at three; but at four they are apt to fail. If it be necessary to buy Asparagus plants for these beds, it will be proper to procure twice as many as are required. The best must then be selected for planting, and the remainder placed in some remote portion of the prepared bed, or into a similar situation, but without separating the plants. Here they must first be covered with four inches of sand during the summer, and as soon as the frosts sets in, with six inches of dung over that. (*Ibid.* ii. 248.)

FORCING.

BEFORE proceeding with the various modes of Asparagus forcing, it will be well to remark, that no mode, be it ever so complete or scientific, can ever produce good Asparagus if the crowns are weak, or, in other words, unless the plants have made strong shoots the summer previously, and a comparative freedom or rest from the knife. It is a serious mistake to think of forcing old and worn-out beds; to be sure, if such are to be broken up, it is, perhaps, better to force them than to throw the roots away; but why keep beds until they are worn out?

We have before urged that the cultivation of Asparagus, carried well out, is not only exceedingly profitable in itself, but is, when forming part in a regular and systematic rotation of crops, one of the most important matters connected with the garden. The Brassica tribes are so numerous, and required in such frequent succession, that the soil frequently becomes, in technical phraseology, "tired" of this family. The greatest of renovators, therefore, are, of course, those crops which remain longest on the plot of ground assigned to them, and of such we would particularly name the raspberry, the strawberry, and the asparagus. The Brassica family will, of course, follow such crops well, and the exhausted Brassica ground may be brought in order by celery beds, or otherwise, for any of the above restorers.

We would now merely observe, that Asparagus forcing, under whatever mode, necessarily falls under two sections, viz., forcing it in its growing bed, and removing it to pits, frames, or houses, to force.

There are various modes practised, concerning which we shall give the necessary details, but whatever mode be adopted, the earliest time to commence forcing is at the end of September. If the heat is well sustained, the plants will produce available shoots in the course of from four to six weeks, according to the length of the days, and will continue in production for about three weeks. To have Asparagus at Christmas, begin forcing in the middle of November.

Forcing the Open-ground Beds.—This mode was first suggested by the late Mr. P. Lindegard, gardener to the King of Denmark. His directions are succinctly as follows :—Stir up the beds in the open garden with a fork, about five weeks before you wish for a cutting, and heighten them with a spit taken from the alleys, which are to be two feet wide, and the beds four feet wide, having two rows of plants on each bed; deepen the alleys to three-and-a-half feet, then fill them with hot fermenting dung, and cover the beds with litter. One plank over the alley, and another along the centre of the bed, between the two rows, will enable a man to walk and gather the crop, without injuring anything. (*Trans. Hort. Soc.* v. 79.)

The open-ground forcing, in the ordinary beds, is sometimes tolerably successful, but on the whole we should consider it inferior to some of the other modes, unless planted specially for the purpose in short lengths, running north and south. For in forcing an ordinary bed it takes a considerable amount of dung to penetrate one row only on each side; when, however, instead of one long bed we have several short ones, parallel, we can fill several trenches, which then act in concert, and the whole mass of soil becomes warmed. When, however, pigeon-holed brickwork is added to support the sides, the whole becomes much more complete and permanent.

Mr. D. Spiers, formerly at Mr. Knight's Nursery, King's-road, has improved upon this plan: he makes the beds in width 4 feet 8 inches, and bounded on the sides by pigeon-holed brickwork, 2 feet deep, and they should be east and west, in order that the frames may face the south. A bed of 60 feet in ength will require three frames of 15 feet in length each, and 4 feet 6 inches wide. The compost for the bed must consist of one-half sandy loam, one-fourth bog, or good vegetable mould, and one-fourth good rotten dung, all well mixed together. With this fill the bed, so that, when settled down, it may be a little higher than the brickwork. The side trenches should be 2 feet wide and 2 feet deep; these are intended to receive the linings. Along the middle of each trench a drain should be made of common draining tiles, to keep the linings free from water. The bed will hold four rows of plants, 11 inches distant from each other and from the sides of the beds. Strong one-year-old plants should be preferred, and planting in the month of April. The plants should be allowed three years to establish themselves before they are forced. In the month of October, before it is intended to begin forcing, the stems should be carefully cut off, and the surface cleared, and covered with littery straw, 12 inches thick; the trenches may also be filled with the same, in order to keep the whole dry. If forcing is to begin on the 1st of December, clear away the covering of litter to about 18 inches farther than the length of the first frame; fill the trenches with good, hot, stable-yard dung, well beaten down, and carry up to about 18 inches higher than the surface; next fork up and rake the surface of the bed, and immediately cover it, from lining to lining, with prepared dung, a few inches higher than the linings. In about twelve days after applying the dung examine the bed. If the buds have begun to appear, or as soon as they do, get the frame and lights ready to be put on; remove the dung from off the bed, laying it on each side, the greater portion to the back; when the bed is cleared, sift over the surface a little previously prepared fine mould; set on the frame and lights immediately, and work up the linings with the dung taken off the bed, laying a part at the ends; and then double mat the frame for two days. When the linings have taken their fresh heat, the covering may be removed every morning as early as the weather will permit, again matting up early enough in the afternoon, and keeping up the heat of the linings, should they decline. When the shoots have risen about 2 inches, particular attention should be given in admitting air, in order that the crop may have a good colour; and, with such management, cutting may commence on Christmas-day. In ten days after the crop in the first frame comes into use, preparations must be made for the second, and so for the third, in the way above described. The frames are placed close to each other, and all managed in the same way. The remaining portion of the bed receives the first frame, and will only require a back and front lining, which will give, assisted by the second and third frames, a fair supply till the natural crop comes in. When the forcing is over, the bed should be covered, 3 inches thick, with rotten dung; and if occasionally watered in the ensuing summer with manured water, it much assists plants which are intended to be forced every season. If the dung in the trenches is wanted for other purposes, they should be filled with litter, to preserve the sides of the bed from drought. Forcing should not be begun always at the same end of the bed, but alternately. Wood covers, 15 feet 6 inches in length, by 4 feet wide, are very useful for sheltering the bed by night, or in severe weather, especially in keeping the whole dry. It is needless to show how far this system of forcing Asparagus may be extended, or to point out to practical men the advantages attending it. Parallel beds may be forced in the same way, so that the intermediate linings be not too much trodden on, as this always checks their working kindly. Beds so treated will continue productive for many years. (*Gard. Mag.* iv. 360.)

It may here be remarked, that Mr. Spiers, as we well remember, was amongst the very first to lead the way in this mode of forcing. His principles are undoubtedly right; he, however, errs, we conceive, in point of the direction of the beds. We cannot but think, that in Asparagus cultivation, as also in the cultivation of most crops, that rows north and south are at all times preferable to those east and west. In thus judging we assume two points, viz., that plants in that direction enjoy more light, and that the aggregate amount of light, during the growing season, in Britain is certainly no more than sufficient.

Mr. Spiers used, we think, glass frames, but there is not the least need of them. We have grown for the last twelve years first-rate Asparagus in such pits with a wooden span roof, which we shall here describe.

Our brick pits are pigeon-holed; the pits are forty-two inches in width, and the alleys about twenty-six inches. The beds receive only two rows of Asparagus, which are planted about nine inches from the exterior walls, thus leaving a space of about twenty-four inches between the two rows. The beds are north and south, and in lengths of nine feet, and being in parallel lines, one lining, of course, works what is equivalent to a whole bed,—viz., a couple of rows. The plants are placed only ten inches apart, and the quantity of produce in weight that has been obtained from these beds, for years, is truly surprising. We never had the curiosity to weigh the produce, but this we can say, that our Asparagus has generally excelled that of all competitors at the country shows. We have no very distinct mode of cultivation for these pits, merely putting in practice the manurings and other matters connected with high cultivation, described in the section on open-ground culture. We take care, after forcing, to protect with litter the straggling shoots remaining above ground, and suffer the beds to rest for one season. Here, as in open-ground culture, we lay the utmost stress on feeding the plants in the alleys by means of their annual roots, and to this end we turn over the remains of the fermented materials in the alleys in the month of April, using soil or other old matter to blend with the manure, in order to induce a rapid and vigorous action of root. The roots they make in one summer, in a proper medium, is indeed surprising, and any one closely observing this would, we think, on due consideration, at once see the propriety of paying extra attention to the alley cultivation. We may here state, that our wooden covers are of a span-roofed character; the roof of a very flat pitch; the sides, which rest on the brickwork, are about nine inches high; and the cover, altogether, is nine feet, one covering the whole bed. The roof is formed of what is termed "feather-edged boards," and the second of these is not nailed fast, but may be drawn down at pleasure to inspect or cut the crop. The forcing routine is very similar to that so ably described by Mr. Spiers.

Forcing in Stoves, Pits, &c. Age of Plants.—Such plants must be inserted in hotbeds as are five or six years old, and appear of sufficient strength to produce vigorous shoots; when, however, any old natural ground plantations are intended to be broken up, at the proper season some of the best plants may be selected to be plunged in a hotbed or any spare corner of the stove bark beds. When more than ten years old, they are scarcely worth employing. To plant old stools for the main forcing crop is, however, decidedly erroneous; for, if plants are past production, and unfit to remain in the garden, little can be expected from them when forced.

Produce.—To have a regular succession, a fresh bed must be formed every three or four weeks, the last crop to be planted in March or the early part of April: this will continue in production until the arrival of the natural ground crops. The last made beds will be in production a fortnight sooner than those made about Christmas.

If the forcing be conducted in a pit or hotbed, and the plants are placed very close together, each light will afford a gathering once in three days, and yield altogether between 300 and 400 heads.

In Vinery or Peach-house.—Mr. Niven says that, perhaps there is no more simple or successful mode of forcing than that of placing the roots in the border of an early vinery or peach-house at work, where, by being closely placed together, the spaces between the roots filled up with fine mould, and covered over about two inches above the crowns, the produce will be rapid and regular, in proportion as the house may be more slowly or quickly forced. A succession may be kept up in this way, where there may be several such forcing-houses; as it is only in the early stage of the forcing of such houses that Asparagus will succeed best when grown in them. In a similar way a good succession of Asparagus may be kept up from an exhausted tan-pit, where pines have been grown the preceding season. (*Gard. and Flor.* iii. 147.)

We must here observe that, where the establishment possesses a peach-house and early vinery, there is also generally a spare frame or pit, and such will be found more eligible for the purpose. There is generally some inconvenience arising from applying such houses to this purpose; nevertheless, when no objection exists, Asparagus may be forced in such situations.

Forcing in Dung Beds and Pits. Bed.—The hotbed must be substantial, and proportioned to the size and number of the lights, and to the time of year. The common mode of making a hotbed is usually followed. The bed must be topped with six inches of light rich earth.

Quantity necessary.—If a small family is to be supplied, three or four lights will be sufficient at a time; for a larger, six or eight will not be too many. Several hundred plants may be inserted under each, as they may be crowded as close as possible together; from 500 to 900 are capable of being inserted under a three-light frame, according to their size.

Mode of planting.—In planting, a furrow being drawn the whole length of the frame, against one side of it the first row or course is to be placed, the crown upright, and a little earth drawn on the lower ends of the roots, then more plants again in the same manner, and so continued throughout, it being carefully observed to keep them all regularly about an inch below the surface; all round on the edge of the bed some moist earth must be banked close to the outside roots.

Precautions necessary.—If the bed is extensive, it will probably acquire a violent heat; the frames must therefore be continued off until it has become regular, otherwise the roots are liable to be destroyed by being, as it is technically termed, scorched or steam-scalded.

Treatment.—When the heat has become regular the frames may be set on; and more earth be applied by degrees over the crowns of the plants until it acquires a total depth of five or six inches.

The glasses must be kept open an inch or two, as long and as often as possible, without too great a reduction of temperature occurring, so as to admit air freely and give vent to the vapours; for on this depends the superiority in flavour and appearance of the shoots. The heat must be kept up by linings of hot dung, and by covering the glasses every night with mats, &c.

The old practice of forcing in dung-beds is not to be excelled as to the speedy production of good Asparagus; and as we have practised this to a considerable extent for the last twenty years, and with very excellent success, we will just give a detail of our practice. We throw the dung together to ferment, and turn and water it a couple of times. When tolerably sweet, a frame is selected—generally an old dilapidated one—and the bed is built about two or three feet high at back, according to the season of the year. In building the bed, a very small amount of the dung is made use of, the chief of the bulk being tree leaves. We place a foot of leaves on the ground, then a foot or nearly so of the dung, and carry up the remaining height chiefly with the leaves, raising a kind of rim of dung all round the frame at last, in order to form a deep cavity within to contain the roots. We then, without waiting for the heat to rise, place the roots on the surface, first coating the warm leaves with three inches of old mellow and very rotten manure. The plants are taken up with their roots as entire as possible, and placed as thickly together as they can be packed, and when the frame is filled, a little very old tan is strewed through them, washing it into all the crevices with tepid water; the water, however, at this period we use as sparingly as possible. The crowns being barely covered, we close up the frame, and cover it with mats, nailing them close down. A lining is then applied all round the frame, carrying it as high as the top of the woodwork. In the course of three or four days the heat will rise; and at this period the frame requires close attention, or the roots will burn. When the bottom heat reaches 85 degs. we give the whole a thorough watering with tepid water, in order to reduce or check the heat, using good liquid manure, and putting a single handful of common salt in each large water-can; these hold about three or four gallons of water. This settles the earth into every crevice, and reduces the heat to about 70 or 80 degs. We then cover the whole surface with about six inches of old tan. In a couple of days it should be closely examined, and the bottom heat proved, when, if it shows a disposition to rise beyond 75 degs., we water again with a similar mixture, and withdraw a part of the lining; indeed, we hereafter manage the internal heat by the linings, applying or withdrawing them at pleasure. Little trouble of this kind, however, occurs, as the leaves are neither so violent or so fitful as dung. As soon as the Asparagus comes through, we take off the mats, and commence giving air—night and day, if possible—and gradually inure the shoots to the light. When the crop is nearly all through, we water again with the saline mixture in a tepid state, and endeavour by all means to increase the air, preserving still a small bottom heat of about 70 degs. If the Asparagus comes to hand too fast, and is required to be kept back for special occasions, we merely lower the bottom heat with more water. By these means we have excellent success, and with a small amount of trouble. The Asparagus, too, is well coloured, and might be taken for the production of out-door beds in the month of May.

Mr. Davison, gardener to Sir J. Guest, Bart., of Dowlais, Glamorganshire, has given a very good detail of the routine of culture in pits. He observes, that this system of forcing in pits is beginning to become general, and is in every respect much better than with dung. The pits can be erected at a moderate expense; and, with a trifling additional outlay, we can have Asparagus the whole of the winter. It is not necessary that these pits should be formed with more than six or eight of the ordinary sized garden-lights; and where a general succession is required, there should be two such pits in use for that purpose. They should be heated with hot water pipes or smoke flues. Hot water is the best, and by adopting it the two pits may be readily heated from one boiler, with the necessary stop-cocks. The pits should be so constructed that the plants will be near the glass, that they may enjoy the benefit of the sun when in a growing state: this is a particular point to be noticed in forcing Asparagus as well as other plants. The roots to be forced should, at least, be six years old, and such that have sent up strong stems the preceding summer. The plants thus selected, and intended for this purpose, should either be covered with rough litter, to prevent the frost entering the ground where they are; or, otherwise, they should be taken up, and deposited in sand, where they will not become too dry. In the pits, when prepared for them, there should be three or four inches of soil placed; the roots of the plants should as much as possible be preserved at the time of lifting, and they should be placed in the pits as level as possible; then, with a sieve, sift among the roots some fine soil, decayed tan, leaves, or any thing that is light, and will readily fall in among them: this must be done to the depth of four or five inches, then give the whole a good watering to settle the soil; close the pit, and keep it so till vegetation commences, and then air must be admitted freely, and all the light that can possibly be secured: this materially assists in getting the buds of a fine green colour and good flavour. The temperature of the pits may range from 45 to 60 degs. Fahrenheit; but 50 and 55 degs. is best as the highest, unless it is required to provide a supply for some particular day. Where pits are heated by hot water, it is an easy matter to steam them, which is highly beneficial when the plants are in a state of vegetation. Thus managed, the plants require but little water, particularly in the winter months: but it must be borne in mind that, when it is required and applied, it must be of the same temperature as the pit in which the plants are growing. Where a general succession is wanted, this method will be found to answer; a fresh plantation must, however, be made about every 12 or 18 days. It is not necessary, in forcing Asparagus, that it should have bottom heat; but where a small quantity is required, it is often forced on dung beds, and in such cases the grower should be cautious against a strong bottom heat, which, accompanied by the steam from the dung, is injurious to the plants when in a growing state. Where it is wanted, even in small quantities, the frame is best placed on brickwork, with pigeon-holes in it, as recommended by M'Phail; and the bottom may be covered with slate or bricks, and thus the steam will entirely be prevented from getting among the plants. (*Flor. Journ.* 1845, 31.)

That Mr. Davidson's plan, here described, will succeed there can be no doubt. To build pits with hot water piping for this purpose is, however, a rather costly affair, unless they are intended for growing melons in afterwards, in both which cases we think that a tank bottom heat would be a valuable adjunct. Indeed, we do not see why the atmospheric heat necessary should not be produced by means of a tank bottom heat alone; slides to graduate being provided in order to admit atmospheric moisture from the chamber containing the pipes, at pleasure. With all due respect, we must beg to differ from Mr. Davidson in one matter. He seems to think bottom heat almost unnecessary: we think it the grand essential in the whole affair.

Temperature.—The night temperature should not be below 50 degs., though some gardeners do not object to 45. The day temperature may range from 60 to 65 degs. It must be borne in mind that Asparagus is very impatient of a high temperature to its roots, therefore the bottom heat should be carefully attended to.

We are here tempted to offer a suggestion as to a kind of simple pit, which would, we conceive, be very useful to the amateur in a small way; for such can scarcely hope to build pits, and apply hot water for the forcing of Asparagus alone. The little greenhouse of the owners of small gardens is too frequently crowded to suffocation in the months of March and April; the Fuschias, the Hybrid Roses, the Calceolarias, the Corierarias, the Geraniums, &c., &c., begin to enlarge at that period, and to shoulder each other. A pit, or pits, therefore, that would grow Mushrooms, and force Sea-kale, Asparagus, and Rhubarb, through December, January, and February, might be so planned as to receive the thinnings of the greenhouse in the middle of March, and be made available for store plants, or as a temporary protection to Ericas, or choice New Holland, or other plants, through the summer. We would, therefore, suggest narrow brick pits, built almost entirely below the ground level, with walls, pigeon-holed up to a certain height; this level kept below the surface of the bed inside.

A retaining wall for linings would, perhaps, be necessary. These pits need not be more than three feet wide, and, instead of glass, might be fitted with a kind of wooden box, possessing a slanting opaque roof, with hinges made to tilt up at pleasure. By introducing a bottom heat of well-fermented dung, or dung and leaves, in the early part of November, and applying linings, the above roots might be easily forced.

The Hyacinth and other Dutch bulbs, which require darkness, would also find a place here.

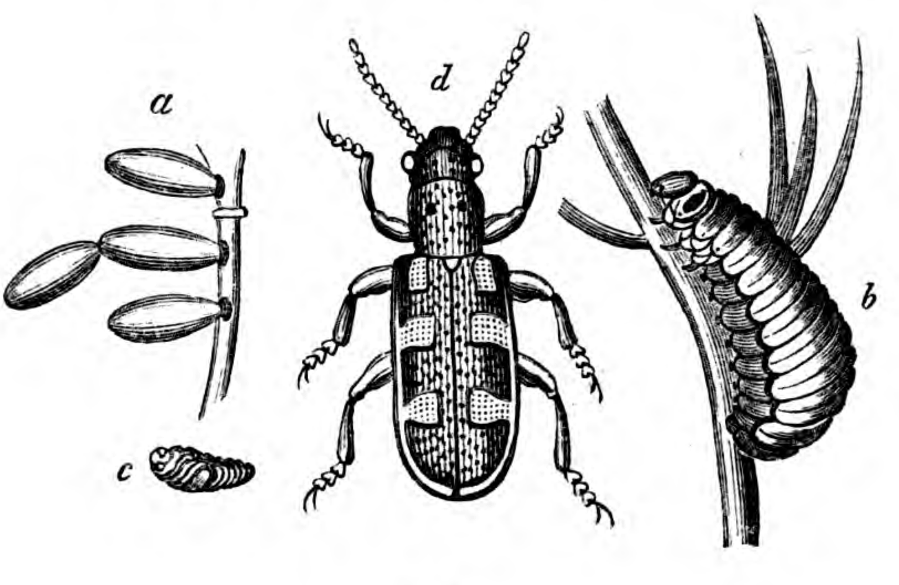
In the middle of March the surface of the rotten manure might be taken away for the garden purposes, and its place supplied with coal ashes or sand, after lime-watering the whole to destroy the earth worm. The linings might also be in part removed, and their surface cased over, and rendered solid, for the proprietor to walk over with comfort. Such a pit in summer would serve to keep successions of choice stock in for the greenhouse or drawing-room; the lids being propped up in the day, and closed, or partly so, at night.

DISEASE AND INSECTS.

We are not aware of any disease to which Asparagus is liable, for although its roots occasionally decay to an injurious extent, it is only when they have been wounded by careless cultivation.

Slugs sometimes deface the young buds of Asparagus to a great extent; especially on stagnant soils, and in cold periods, when the "grass" grows slowly. The late spring frosts, which sometimes damage this crop, will frequently so stagnate the progress of the buds, both above and below the surface, that slugs, snails, &c., feed upon and deface them. An abundant application of salt is the best remedy.

Crioceris asparagi.—The Asparagus Beetle. For the following description and particulars relative to this occasionally destructive, though beautiful little coleopterous insect, we are indebted to Mr. J. O. Westwood, F.L.S. It is usually about a quarter of inch in length, of an oblong form, with the head rather broader than the thorax, which is cylindrical, and narrower than the elytra. Its general colour is a fine blue black: this is the colour of the legs and head; the antennæ are black; the thorax, or, more properly speaking, the upper surface of the prothorax, is of a fine red, with two dorsal black spots, which, in some individuals, are so small as to be scarcely visible. The elytra are long, each having several rows of impressed spots; the external margin



is orange-coloured; the central part, or suture, blue black; the disc of each elytra is varied with cream-coloured and blue black marks, which have somewhat the appearance of a cross, being in the centre of the back. These spots vary occasionally in their size: sometimes, for instance, the pale humeral spot is wanting, and in others the bars of the cross disappear. The specimen figured represents the ordinary appearance of the insect; the eggs (*a*); the larva (*b*); the pupa (*c*); and the perfect insect (*d*); all greatly magnified.

The injury, we have no doubt, which a young seedling bed would receive from its attacks would have the effect of greatly weakening the roots; for the whole of the leaves (as we may term the slender elegant spray) being entirely consumed, the plants would necessarily loose a great deal of nourishment, and be less able, in the following spring, to throw up good heads, which, of course, it is the cultivator's chief interest to obtain.

It is not, however, by the insect in the perfect state that the mischief is caused: at this period of its existence, its whole object is to continue its kind, and eating is no longer a matter of necessity; it is by the larva, or grub, that the injury is produced.

The females deposit their eggs upon the young and tender stems, seeming to prefer those which support the flowers. These eggs are of a long oval form, and of a large size compared with the insect; hence, it is probable that a single female does not deposit above eight or ten eggs. They are affixed to the stem at one end, by means of a black viscid secretion, which dyes the surrounding part of the stem for a short distance. We have often observed two eggs placed together, one by being attached at the extremity of the other. Their colour is dirty slate. In a short time the larvæ are produced. In this state, they are quite the reverse of their parents, and, instead of exhibiting a variety of colours and elegant markings, they are of a disgusting form and a dirty slaty green colour, almost black; and, when disturbed, they emit a considerable quantity of thick black fluid. The body is, as usual, composed of 13 segments, the first of which, or the head, is black, and supplied with strong four-toothed jaws, and short antennæ; the next segment, or the prothorax, is marked with two shining black spots, of a leathery texture, and is furnished on the under side with two short, articulated, black legs, as is also each of the two following segments; the remaining segments are gradually thickened. The general consistence of the body is fleshy, the external integument being thin and membraneous; the segments of the abdominal part of the body are furnished with fleshy tubercles, which are employed as legs. The body is also armed at its extremity with a similar pair of these fleshy proleg-like tubercles. It is the habit of the larva of the typical species of this genus (Crioceris merdigera Linn,) to form a covering for itself of its own excrement (in the manner described by Reaumur, and introduced into the Insect Architecture); but the larva of the Asparagus beetle is different in its habits, following the ordinary plan in this respect. The larva are to be found from the end of June till September. They, of course, do not appear until the Asparagus is sufficiently grown for their support; the eggs being deposited on the plants, and not in an adjacent situation; and they arrive at their full growth in about a fortnight. They are most partial to the tenderest shoots.

They shed their skins several times, the exuviæ being visible amongst the unconsumed twigs of the Asparagus. When full grown, the larvæ descend into the ground, where they construct a thick pergameneous cocoon, in which they are transformed into white pupæ of the ordinary form; the limbs, antennæ, and wings being folded in separate sheaths along the breast.

This state lasts about another fortnight, so that six or seven weeks may be considered as the duration of the insect's life, one-third of which is occupied by the egg, another third by the larvæ, and the remaining third by the pupa and imago states. The perfect insect will, however, live a long time if confined.

Some individuals, also, survive the winter; indeed, we are inclined to think that the insect, through this inclement part of the year, is in the imago state, hidden in some secret place or other, and not in the pupa state, as is ordinarily the case with insects in general. Certainly, the closely-allied species, Crioceris cyanélla, may be found under the bark of willows throughout the winter; and Mr. W. saw a perfect specimen of the C. asparagi creeping about the asparagus bed as soon as ever the plants appeared above ground. This, of course, is an important part of the insect's economy; because, if the fact be as he supposes, it will be evident that the beetles, which make their appearance in the spring, are destined to be the parents of the whole of the future broods; and, therefore, by bestowing a little trouble during the time of cutting the asparagus, in order to kill the few beetles then visible (which, from their bright and lively colours, would be a very easy task), much of the subsequent injury would be remedied. It is certain, however, that, if this precaution be not taken, the propagation of the insect is very rapid; and as, during the summer months, it is to be found in the egg, larva, and imago states, at the same time on the same plant, it is evident that there is no regularity in the succession of the broods. Even afterwards, when the asparagus is full grown, some of the plants are liable to be entirely stripped of their foliage by the larva; and it would be worth while, even then, to catch as many of the perfect beetles as possible, in order to diminish the invaders of the next year's crop. The beetle is, however, very cunning; for no sooner is it approached than it turns to the under side of the stalk, and, if disturbed, drops down and feigns death. We have found the best thing to use was a green gauze bag-net, held under the plants, which were then shaken, and the insects fell into it.

Crioceris 12-*punctata* (Linn) is another species of the same genus, which is also found upon the asparagus. In this country, however, it is extremely rare. (*Gard. Mag.* 1837, 337.)

H. WOOLDRIDGE, PRINTER, WINCHESTER.

THE

GARDENER'S MONTHLY VOLUME.

THE GOOSEBERRY;

ITS CULTURE, USES, AND HISTORY.

BY GEORGE W. JOHNSON,

Editor of The Gardeners' Almanack, The Dictionary of Modern Gardening, &c.

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THE GOOSEBERRY.

THE GOOSEBERRY.

HISTORY.

THE gooseberry is especially a British fruit; for although, probably, it is not a native of these islands, yet it is now found wild in our hedge-rows; and in no other country is so much attention paid to its cultivation.

Although a native of Piedmont and other regions of northern Italy, yet, in its wild state, its fruit being small, acid, and flavourless, it does not appear to have attracted the care of the Roman cultivators, nor of any of our early continental ancestors; and it is not until the very commencement of the 16th century that we find it noticed in this country. Gesner thought the gooseberry is the *achanthakeanthos* of Theophrastus, but upon no satisfactory grounds. Dodoens, on whose botanical work our Lyte and Gerarde founded theirs, mentions the smooth-fruited gooseberry as the *Uva crispa;* Bauhine calls it *Grossularia sylvestris;* and Tusser, in his "Five hundred Points of Good Husbandry," published during

1557, mentions "gooseberries" among our then garden fruits.

Lyte, in 1578, says, "it is planted commonly almost along the borders of every garden." The green gooseberry he calls *Uva crispa;* and the *Uva ursi* of Galen, and *Ribes*, are names he applies to "the red-beyond-sea gooseberry;" but this is evidently our red currant, as his black gooseberry is our black currant.

Gerarde, in his "Herball," published 1597, says it is called *Fea-berry* in Cheshire. It has the same name in Lancashire and Yorkshire. This, in Norfolk, is abbreviated into *Feabes*, or, as the provincials pronounce it, *Fapes*. Gerarde says there were then "divers sorts, some greater, others less, some round, others long, and some of a red colour, growing in our London gardens and elsewhere in great abundance."

In the "Paradisus" of Parkinson, published in 1629, are described five varieties of gooseberries or feaberries: three reds, differing only in size; one blue or purple, like the damson; and one green and hairy, of which "the seed hath produced bushes bearing berries having few or no hairs upon them."

Johnson, in his edition of Gerarde (1636), has "the long green, the great yellowish, the blue, the great round red, the long red, and the prickly gooseberry." Ray has no English name but the pearl gooseberry. Rea mentions three sorts of the red, the blue, the yellow of several sorts, the White Holland, and the green, in his "Flora, Ceres, and Pomona," published during 1665. Miller only says, there were in his time (1724) several varieties obtained from seeds, most of them named from the persons who raised them, as Lamb's, Hunt's, Edwards's Gooseberry, &c.; but new ones being continually obtained, he considered it needless to enumerate them. (*Martyn's Miller's Dict.*)

In 1752 the attention of gardeners to raising improved varieties first becomes apparent; for Switzer, in his "Practical Fruit Gardener," then published, says, "the best sorts are the large white Dutch, the large amber, the early red and green, both hairy, Mr. Lowe's early green and walnut gooseberries, with some other very extraordinary kinds of his raising at Battersea, not yet named." Though this shews a somewhat awakened attention, yet the cultivation was still neglected; for Switzer, instead of pruning with the knife, recommends the bushes to be "clipt a little before Midsummer."

Hitt, in his "Treatise on Fruit Trees," is the first author who recommends a careful cultivation of this fruit "of the meaner sort," and gives directions for its pruning and general treatment.

Mr. Loudon observes, that the gooseberry is cultivated in greater perfection in Lancashire than in any other part of Britain; and next to Lancashire, the climate and treatment of the Lothians seem to suit this fruit. In Spain and Italy the fruit is scarcely known. In France it is neglected, and little esteemed. In some parts of Germany and Holland the moderate temperature and humidity of climate seems to suit the fruit; but in no country is its size and beauty to be compared with that produced in Lancashire, or from the Lancashire varieties cultivated with care in the more temperate and humid districts of Britain. Dr. Neill observes, that when foreigners witness our Lancashire gooseberries, they are ready to consider them as forming quite a different kind of fruit. Happily this wholesome and useful berry is to be found in almost every cottage garden in Britain; and it ought to be considered a part of every gardener's duty to encourage the introduction of its most useful varieties in these humble inclosures. In Lancashire, and some parts of the adjoining counties, almost every cottager who has a garden cultivates the gooseberry with a view to prizes gizen at what are called "gooseberry prize meetings;" of these there is annually published an account, with the names and weight of the successful sorts, in what is called the *Manchester Gooseberry Book*. The prizes vary from 10s. to £5 or £10; the second, third, even to the sixth and tenth degrees of merit, receiving often proportionate prizes. There are meetings held in spring to "make up," as the term is, the sorts, the persons, and the conditions of exhibition; and in August, to weigh and taste the fruit, and determine the prizes. In the "Gooseberry Book" is also announced annually the new-named seedlings which have been distinguished at former meetings and that are now "going out," that is, are about to be sold to the propagators. (*Enc. of Garden.* 732.)

It is in Lancashire, as just observed in the quotation from Loudon, and especially at Manchester, that gooseberry culture is carried to the highest degree of perfection. Mr. J. Clarkson, a resident in that vicinity, says that by consulting the gooseberry growers and their records, he found that 50 years ago the heaviest berries seldom exceeded 10 dwts. It was about that time that people began to cultivate the gooseberry in and about Manchester, being stimulated either by a spirit of emulation, or the value of the prizes. The perfection they attained owes nothing to men of scientific knowledge, being cultivated scarcely by any but the lowest and most illiterate members of society, but these, by continual experience and perseverance in growing and raising new sorts, have brought the fruit from weighing 10 to upwards of 30 dwts., and that, too, under the greatest disadvantages, not having the privilege of soil, manure, situation, &c., like the gardeners of their more wealthy neighbours, but oftentimes limited to a few yards of land, either shaded by trees, confined by buildings, or exposed to the most unfavourable winds, and so barren that they have frequently to carry on their shoulders a considerable way the soil in which the plants are to be set, yet so resolute are they in overcoming every obstacle, and so successfully ingenious in assisting nature in her efforts, that they are enabled to produce fruit surprisingly large. The oldest growers, some of them upwards of eighty years of age, were unable to tell Mr. Clarkson the time when, or the place where, the improvement of the gooseberry first commenced. Lists of several meetings which took place in 1786, are in existence in which the fruit is divided into four classes, red, yellow, green, and white, each class containing four sorts, making sixteen sorts at one meeting, no one sort being allowed to win more than one prize at the same show. The classification of the fruit, the number of meetings held at different places, and the variety of sorts cultivated at the above time, sufficiently prove that meetings must have been held for exhibiting the fruit several years before.

The attention of the growers was early directed to the raising of new sorts, being encouraged by the liberal price given for each deemed to be a large one, all other properties being esteemed of secondary consideration ; so that we are now furnished with an extensive variety, possessing excellent qualities, both for size, quantity, beauty, and flavour. At present there is considerable latitude given at prize shows, as to the properties of this excellent fruit, some sorts being remarkable for their large size, such as the Roaring Lion, and Eagle; others, again, are remarkable for their beauty, such as the Lancashire Lad, Top Sawyer, Rockwood, Sovereign, Bonny Lass, and others; a third group are remarkable for their rich flavour, and a fourth for producing large crops; some sorts have their fruit large very early, while others are small until nearly ripe; some, again, bear large berries, but only a few of them, while other sorts bear both large and numerous berries; some sorts are ripe early, as Top Sawyer, Huntsman, and Rockwood, whilst others continue to grow much longer before they are ripe, such as the Printer, Duckwing, and several more. (*Gard. Mag.* iv. 483.)

BOTANICAL CHARACTERS.

Dr. Martyn considers the name of goose-berry was applied to this fruit, in consequence of its being employed as sauce for that bird. It is somewhat unfortunate for this derivation that it never has been so used. It seems to me most probably to be a corruption of the Dutch name *Kruisbes*, or *Gruisbes*.

Kruisbes, I believe, was derived from Kruis, the Cross, and Bes, as Berry, because the fruit was ready for use just after the Festival of the Invention of the Holy Cross; just as Kruis-haring, in Dutch, is a herring, caught after the same festival. (*Sewel's Dutch Dict.*)

Its earliest botanical names were *Grossularia,* and *Uva crispa;* Linnæus being the first to unite it with the currant, under the generie title of *Ribes.*

Ribes, the gooseberry, is included in the Pentandria Monogynia class and order of Linnæus, and in the Natural order, *Grossulaceæ.* There are many sub-species, but not differing essentially from the following specific characters.

Ribes Grossularia, rough gooseberry. *Prickles,* solitary, or three together. *Branches,* spreading. *Footstalks,* hairy. *Stalks,* single flowered, with a two-leaved bractea. *Fruit,* hairy. *Shrub,* bushy, armed with awl-shaped prickles, in the place of stipulas. *Leaves,* bluntly three-lobed, and cut, slightly downy. *Flowers,* drooping, solitary, green, on downy stalks. *Calyx,* cup-shaped. *Germen* and *Fruit,* rough, with prominent bristly hairs. *Berries,* green, yellow, or red.

R. Uva crispa, smooth gooseberry, seems to be only a variety of the preceding.

CHEMICAL COMPOSITION.

GREEN gooseberries have been analyzed by Mr.

Gerard, who examined the berries both before they were ripe, and when ripe. The constituents found in the two states were the following :—

	UNRIPE.	RIPE.
Chlorophylle (green colouring matter)	0·03	—
Sugar	0·52	6·24
Gum	1·36	0·78
Albumen . . .	1·07	0·86
Malic Acid	1·80	2·41
Citric Acid . . .	0·12	0·31
Lime	0·24	0·29
Fibrin (including the seed) . .	8·45	8·01
Water	86·41	81·10
	100·00	100·00

(*Thomson's Vegetable Chem.*, 892.)

The foregoing analyses show, that the acid constituents of gooseberries increase during ripening, though their presence is concealed by the simultaneous increase of the saccharine matter. The quantity of acid is further increased by exposure to a high temperature, and hence the reason that half-ripe gooseberries require more sugar to render them palateable than do unripe gooseberries, when employed in tarts. Instead of chlorophyle there is a peculiar red colouring matter in the red gooseberry.

VARIETIES.

The varieties of this fruit have now become very numerous, in proof of which, the list which follows is sufficient testimony. The information that list contains is principally derived from the "London Horticultural Society's Catalogue of Fruits."

Duration.—A gooseberry bush will live for many years under proper management, but it is never so vigorous for the production of fruit as from its fifth to its eighth year.

Size.—It must be always remembered that neither the amateur nor even the professed gardener will be able in most instances to grow berries equalling the size of those which they attained under the care of their original raisers. The particular treatment, probably, will not be adopted, and this is so well known among the growers for prizes that they avoid purchasing seedlings of their raisers until other growers have reported upon them.

Selections.—The following is a list of good flavoured and very large sized, those of each colour being placed in the order of ripening:—***Reds:*** Keens's Seedling, Mellings's Crown Bob, Leigh's Rifleman, Boardman's British Crown, Red Warrington. *Whites:* Taylor's Bright Venus, Wellington's Glory, Saunder's Cheshire Lass, Woodward's Whitesmith, Cook's White Eagle. ***Greens:*** Parkinson's Laurel, Large Smooth Green, Collier's Jolly Angler, Massey's Heart of Oak, Edwards' Jolly Tar. *Yellows:* Didon's Golden Yellow, Prophet's Regulator, Prophet's Rockwood, Brotherton's Golden Sovereign, and Pilot.

The following are small, but of very good flavour. *Reds:* Red Champagne, Red Turkey, Rough Red, Ironmonger and Rob Roy. *Whites:* White Champagne, White Crystal, Early White, Taylor's Bright Venus and White Honey. *Greens:* Early Green Hairy, Pitmeston Greengage and Green Walnut. *Yellows:* Yellow Champagne and Rumbullion.

For Bottling, the best variety is the Rumbullion.

For Preserving, the best are the Red Champagne and the White Eagle. The first gives a deep red to the syrup, but the latter imparts as good a flavour and requires less sugar. Its syrup, made with loaf sugar, is slightly pink.

Aaron (Lovart's). Yellow, hairy, oblong, large. Second quality. Branches spreading.

Abraham Newland (Jackson's). White, hairy, oblong, large. First quality. Branches erect, excellent.

Admirable (Grange's).

Ajax (Gerrard's). Red, smooth, roundish, large. Third quality. Branches spreading.

Alexander. Red, hairy, obovate, large. Second quality. Branches spreading.

Amber (Amber Yellow, Smooth Amber). Yellow, smooth, roundish, small. Second quality. Branches spreading. Good bearer.

Amber Hairy. See Yellow Champagne.

Ambush (Cranshaw's.) White, smooth, obovate, large. Second quality. Branches erect. Late.

Angler. Green. Greatest weight 20 dwts. 1 gr.

Anson's (Colonel). Green, hairy, oblong, large. Third quality. Branches spreading. Late.

Aston. See Red Warrington.

Aston Red. See Red Walnut. Excellent.

Aston (Hebburn Yellow). Yellow, hairy, roundish, small. First quality. Branches erect.

Aston Seedling. See Red Warrington.

Atlas (Brundrett's. Brundretts Atlas). Red, hairy, oblong, large. Second quality. Branches erect.

Audley Lass (Williams'). Green, hairy, oval, large. Third quality. Branches spreading.

Ball (Yellow). Yellow, smooth, roundish. First quality. Branches erect.

Balmure.

Bang-up (Tyrer's). Red, hairy, roundish oblong, large. Third quality. Branches pendulous. Greatest weight 20 dwts. 12 grs.

Bank of England (Walker's). Dark red, smooth, obovate, large. Second quality. Branches pendulous. Pulp tinged with yellow.

Battle of the Nile. Red. Greatest weight, 18 dwts. 5 grs.

Beauty of England (Hamlet's). Red, hairy, oblong, large. Second quality. Branches spreading.

Beauty (Holt's). Green, downy, oblong, large. Second quality. Branches pendulous.

Belmont. Yellow. Greatest weight 13 dwts. 16 grs.

Belmont's Green. See Green Walnut.

Bellingham. Green. Greatest weight 14 dwts. 8 grs.

Bell's Gift. Green. Weight 24 dwts. 23 grs.

Birdlime. Yellow. Greatest weight 25 dwts. 15 grs.

Billy Dean (Shaw's). Red, smooth, obovate, large. Third quality. Branches spreading.

Black (Waverham's Bullfinch). Dark red, downy, obovate. Second quality. Branches spreading.

Black Prince (Shipley's). Dark red, downy, roundish, middle size. Third qnality. Branches pendulous.

Blithfield. Yellow, smooth, round, small. Second quality. Branches erect. Late.

Blucher. Red. Greatest weight 17 dwts. 1 gr.

Bloucher. Green. Greatest weight 14 dwts. 21 grs.

Boggart (Houghtons). Dark red, smooth, obovate, very large. Third quality. Branches pendulous.

Bonny Landlady (Noble Landlady). White, hairy, oblong, large. Second quality. Branches erect.

Bonny Lass (Capper's). White, hairy, oblong, large. Second quality. Branches spreading. Berry handsome. Greatest weight 21 dwts. 10 grs.

Bonny Roger (Diggles's). Yellow, smooth, obovate, large. Second quality. Branches spreading. Greatest weight 20 dwts. 10 grs.

Bottom Sawyer (Capper's). Yellow, downy, obovate, large. Second quality. Branches spreading. Leaves downy above.

Bright Venus (Taylor's). White, hairy, obovate, middle size. First quality; branches erect; excellent. Hangs till it shrivels.

Britannia (Sister's). Yellow, downy, obovate, large. Third quality. Branches spreading.

British Crown (Boardman's). Red, hairy, roundish, very large. Second quality. Branches spreading. Greatest weight 20 dwts. 20 grs.

British Hero. Red. Greatest weight 17 dwts. 10 grs.

British King. Green. Greatest weight 12 dwts. 5 grs.

British Prince (Boardman's). See Boardman's Prince Regent.

Brownsmith.

Bullfinch. See Waverham's Black.

Bumper. Green. Good bearer. Greatest weight 24 dwts. 16 grs.

Bunker's Hill (Capper's). Yellow, smooth, roundish, large. Second quality. Branches spreading.

Burdett. Red. Greatest weight 16 dwts. 19 grs.

Captain Greenall. Green. Greatest weight 13 dwts. 17 grs.

Captain (Red). *Captain* (White).

Catharina. Yellow. Greatest weight (1845) 30 dwts. 4 grs.

Chadwich. White. Greatest weight 15 dwts. 19 grs.

Chain. Yellow. Greatest weight 18 dwts. 20 grs.

Champagne (Green). Green, smooth, roundish, small. Third quality. Branches erect. Leaves downy above.

Champagne (Barclay's green). Green, smooth, roundish, middle size. Third quality. Branches spreading.

Champagne (Large Pale). Green, downy, roundish, oblong, small. First quality. Branches pendulous. Leaves downy.

Champagne (Red). Red Turkey (of some) ; Dr. Davis' Upright ; Countess of Errol ; Ironmonger (of many). Red hairy, roundish, oblong, small, First quality. Of unequalled richness. Pulp clear. Branches remarkably erect.

Champagne (White). White, hairy, roundish, oblong, small. First quality. Branches erect. Leaves pubescent.

Champagne (Yellow. Hairy Amber). Yellow, hairy, roundish, small. First qulaity. Branches erect. Excellent.

Chance (Green). Green, downy, oblong, large. Third quality. Branches pendulous.

Charles Fox (Monck's). Green, hairy, ovate, small. Second quality. Branches erect.

Cheshire Lady. Red, hairy, oblong, middle size. First quality. Branches erect. Late. Excellent.

Cheshire Cheese (Hopley's), Yellow, smooth, oblong, large. Third quality. Branches spreading. Greatest Weight 17 dwts. 8 grs.

Cheshire Lass (Saunder's). White, downy, oblong, large. First quality. Branches erect. Earliest and best to gather green for tarts. Greatest weight, 19 dwts. 1 gr.

Chisel. Pale green, smooth, oblong, large. Third quality. Branches spreading. Skin thin.

Chisel. Green. See Viner's Green Balsam.

Chorister. White. Greatest weight, 12 dwts. 19 grs.

Chrystal. White, smooth, roundish, small. First quality. Branches spreading. Late. Good bearer.

Chrystal. (Red).

Chrystal (White). White, hairy, downy, roundish, small. First quality. Branches spreading.

Claret. Red, smooth, roundish, small. Second quality. Branches spreading.

Colonel Holding. Yellow. Greatest weight, 17 dwts.

Commander. Red. Greatest weight, 16 dwts.

Companion. Red. Very large. Greatest weight, 31 dwts. 5 grs.

Competition. White. Greatest weight, 22 dwts. 1 gr.

Conquering Hero (Chipendale's). Green, hairy, oblong, middle size. Third quality. Branches spreading. Bad bearer.

Conquering Hero (Catlow's). Green, yellow, hairy, oblong, middle size. Third quality. Branches erect.

Conquering Hero. Red. Greatest weight (1845), 30 dwts. 18 grs.

Conqueror (Fisher's. Cook's Defiance). Greenish yellow, smooth, oblong, large. Third quality. Branches spreading. Bad bearer. Greatest weight, 16 dwts. 12 grs.

Conqueror (William's). Red, hairy, obovate, large. Second quality. Branches pendulous.

Conqueror (Worthinton's). Red, smooth, obovate, large. Third quality. Branches pendulous. Late.

Cornwall. Dark, hairy, oblong, large. Third quality. Branches pendulous.

Corduroy. Green. Greatest weigh, 15 dwts. 8 grs.

Cossack. White. Greatest weight (1845), 25 dwts. 16 grs.

Cotgrave. Red. Greatest weight, 17 dwts.

Cottage-girl (Heap's). Greenish yellow, hairy, oblong, large. Third quality. Branches erect.

Counsellor Brougham. Green, white, downy, oblong, large. Second quality. Branches spreading. Good bearer.

Countess of Errol. See Red Champagne.

Creedus. Yellow. Greatest weight 14 dwts. 2 grs.

Creeping Ceres. Yellow. Greatest weight, 14 dwts. 12 grs.

Crown Bob (Melling's). Milling's Crown Bob. Red, hairy, oblong, large. First quality. Branches spreading. Very good. Considered most profitable and therefore most cultivated by Lancashire Market Gardeners. Preserves well. Greatest weight 22 dwts. 17 grs.

Croyer's Favourite. Green. Greatest weight, 15 dwts. 10 grs.

Croyer's Red. Red. Greatest weight, 15 dwts. 10 grs.

Dakin's Black. Dark red, downy, oblong, middle size. Second quality. Branches erect. Bad bearer.

Damson (White). White, smooth, roundish, small. First quality. Branches erect. Skin thin.

Dark Red (Large.)

Dr. Davis's Upright. See Red Champagne.

Defiance (Cook's). See Fisher's Conqueror.

Defiance (Worthinton's). Red, hairy, obovate, large. Second quality. Branches pendulous. Greatest weight, 28 dwts.

Delight (Weedham's). Needham's Delight. Green, yellow, hairy, oblong, large. Third quality. Branches pendulous. Bad bearer. Greatest weight, 19 dwts. 8 grs.

Double-bearing (Eckersley's). See Red Walnut.

Downy Yellow.

Drap d'Or.

Dublin. Yellow. Greatest weight (1845), 26 dwts. 16 grs.

Duchess. White. Greatest weight, 14 dwts. 6 grs.

Duck Wing (Buerdsill's). Yellow, smooth, obovate, large. Second quality. Branches erect. Late.

Dudley and Ward. Pale red, smooth, oblong, large. Third quality. Branches pendulous.

Duke of Waterloo. Yellow. Greatest weight, 16 dwts. 11 grs.

Duke of York (Allcock's). See Leigh's Rifleman.

Dumpling. See Scotch best Jam.

Dusty Miller (Stringer's). Greenish white, smooth, obovate, middle size. Second quality. Branches pendulous. Greatest weight 14 dwts. 10 grs.

Earl of Denbigh. Green. Greatest weight, 14 dwts. 22 grs.

Earl Grosvenor. Red, downy, obovate, large. Second quality. Branches pendulous. Greatest weight 21 dwts. 9 grs.

Earl Moira. Red. Greatest weight, 17 dwts. 2 grs.

Early Black. Dark red, hairy, oblong, middle size. Second quality. Branches pendulous.

Early green Hairy. Early Green. Green Gascoigne. Green, hairy, round, small. First quality. Branches spreading. Early and good.

Early Rough Red. Red, hairy, roundish, oblong. Second quality. Branches spreading.

Early Red.

Early White. White, downy, roundish, middle size. First quality. Branches spreading.

Elijah (Lovart's). Red, hairy, roundish, large. Second quality.

Elisha (Lovart's). Green, hairy, roundish, large. Second quality. Branches spreading. Greatest weight, 18 dwts. 21 grs.

Emperor Napoleon (Rival's). Red, smooth, obovate, large. Second quality. Branches, pendulous. Good bearer. Late. Greatest weight, 22 dwts. 18 grs.

English Rose. Red. Greatest weight, 17 dwts. 16 grs.

Evergreen (Perring's). Green, smooth, oblong, large. Third quality. Branches spreading. Greatest weight, 18 dwts. 12 grs.

Expectation. Green. Greatest weight, 14 dwts. 23 grs.

Fair Play. Green. Greatest weight, 14 dwts. 16 grs.

Fair Rosamond. White. Greatest weight, 15 dwts. 12 grs.

Fame. Green, smooth, obovate, large. Third quality. Branches pendulous.

Farmer. See Chapman's Jolly Farmer.

Farmer's glory (Berry's). Red, downy, obovate, large. First quality. Branches pendulous. Good bearer.

Favourite (Bates'). Green, smooth, oblong, middle size. Second quality. Branches pendulous. Greatest weight, 19 dwts. 4 grs.

Favourite (Smith's). Red, hairy, roundish oblong, middle size. Second quality. Branches spreading.

Fig (White). White, smooth, obovate, small.

First quality. Branches spreading. Rich; but a tender plant.

First Rate (Parkinson's). White, smooth, oval, large. Second quality. Branches pendulous. Greatest weight, 21 dwts.

Fleur de Lis. White. Early. First quality.

Fowler (Grundy's). White, downy, obovate, middle size. Third quality. Branches spreading. Greatest weight, 17 dwts. 8 grs.

Foxhunter. Red. Greatest weight (1823), 25 dwts. 2 grs.

Freedom. White. Greatest weight (1845), 27 dwts. 8 grs.

Friend Ned. Red. Greatest weight, 16 dwts. 2 grs.

Fudler (Leigh's). White, smooth, oblong, middle size. Third quality. Branches pendulous. Greatest weight, 14 dwts. 22 grs.

Gallant. Green. Greatest weight, 15 dwts. 2 grs.

Gascoigne green. See Early Green Hairy.

Gascoigne (White.)

George the Fourth. See Red Champagne.

Gibraltar. Greenish yellow, smooth, oblong, middle size. Third quality. Branches pendulous. Greatest weight, 14 dwts. 15 grs.

Gingler. Green. Greatest weight, 14 dwts. 9 grs.

Glasgow Youth. Red. Greatest weight, 15 dwts. 1 grs.

Glenton green. York Seedling. Green, hairy, oblong, middle size. First quality. Branches pendulous. Very good. Leaves pubescent.

Globe (Green). Green, hairy, round, small. Second quality. Branches spreading. Coarse.

Globe (Hopley's). Yellow, hairy, round, large. Third quality. Branches pendulous. Greatest weight 20 dwts.

Globe (Large Red). Red, hairy, roundish, large. Second quality. Branches erect.

Globe (Small Red). Smooth Scotch, Red, smooth, roundish, small. First quality. Branches erect. Sharp rich flavour.

Globe (Yellow).

Globe Yellow (of some). See Rumbullion.

Globe of Europe. White. Greatest weight 11 dwts. 12 grs.

Glorious (Bell's). Speechly's Highwayman. Red, hairy. Greatest weight (1817) 26 dwts. 17 grs.

Glory of England. Yellow, downy, obovate, large. Third quality. Branches pendulous.

Glory of Kingston. Green, smooth, roundish, middle size. Third quality. Branches spreading. Bad bearer.

Glory of Oldham. Red, hairy, oblong, middle size. Second quality. Branches spreading.

Glory of Ratcliff (Allen's). Green, smooth, oblong, middle size. First quality. Branches spreading.

Glory (Whitton's). Dark red, smooth, oblong, middle size. Second quality. Branches pendulous.

Golden Ball. See Early Sulphur.

Ditto Bess.

Ditto Bull. See Early Sulphur.

Ditto Chain (Forbes's). Yellow, smooth, oblong, large. Third quality. Branches pendulous.

Golden Drop. Golden Lemon. Yellow, downy, roundish, middle size. Second quality. Branches erect. Greatest weight 11 dwts. 18 grs.

Golden Eagle (Nixon's). Yellow, downy, roundish, small. Second quality.

Golden Fleece (Part's). Yellow, hairy, oval, large. First quality. Branches pendulous. Resembles Golden Drop.

Golden gourd (Hill's). Green, yellow, hairy, oblong, large. Second quality. Branches pendulous.

Golden Lemon. See Golden Drop.

Golden Orange (Jackson's). Bright yellow, hairy, oblong, large. Third quality. Branches pendulous.

Golden Purse (Bamford's). Barnfort's Golden Purse. Yellow, smooth, obovate, large. Third quality. Branches pendulous.

Golden Queen (Kay's). Lay's Golden Queen. Greenish yellow, smooth, roundish, large. Third quality. Branches pendulous.

Golden Sovereign (Bratherton's). Yellow, hairy, roundish, large. Second quality. Branches spreading.

GoldenYellow (Dixon's). Greenish yellow, smooth, turbinate, middle size. Second quality. Branches pendulous.

Goliath Champion (Costerdine's). Greenish yellow, smooth, oblong, large. Second quality. Branches pendulous.

Goliath (Rider's). Yellow, smooth, obovate, middle size. Third quality. Branches erect.

Gourd. Yellow. Greatest weight 18 dwts. 1 gr.

Governess (Bratherton's). Green, white, hairy, roundish oblong, large. Second quality. Branches spreading.

Governor (Bratherton's).

Great Britain. Greenish white, smooth, oblong, large. Second quality. Branches pendulous. Greatest weight 15 dwts. 18 grs.

Great Captain (Hooper's). Red, smooth, oblong. large. Second quality. Branches spreading.

Great Chance. See Farrow's Roaring Lion.

Great Tup. *Green Anchor* (Bell's). Coarse.

Green Balsam (Viner's). Green Chisel. Green, smooth, obovate, large. Third quality. Branches pendulous. Greatest weight 16 dwts. 2 grs.

Green Bob. Green. Greatest weight 13 dwts. 19 grs.

Green Drop. Green. Greatest weight 12 dwts. 11 grs.

Greenfield Joan. Yellow. Greatest weight 15 dwts.

Green-gage (Horsefield's). Green, smooth, roundish, large. Third quality. Branches spreading. Greatest weight 12 dwts. 4 grs.

Green-gage (Pitmaston). Green mottled with red, smooth, obovate, rather small. First quality. Branches erect. Prickles few. Excellent; very sugary, and will hang till it becomes shrivelled.

Green-globe. Green, round, middle size. Second quality. Branches spreading.

Green Isle. Green. Greatest weight 13 dwts. 5 grs.

Green Knight. Green. Greatest weight 14 dwts. 12 grs.

Green Mountain (Sandiford's). Green, hairy, oval, large. Third quality. Branches spreading.

Green Myrtle (Nixon's). Green, smooth, oblong, large. Second quality. Branches pendulous.

Green Oak. Green, hairy, roundish, large. Second quality. Branches erect.

Green Ocean (Wainman's). Ingham's Green Ocean. Green, smooth, oblong, large. Third quality. Branches pendulous.

Green Page. Green. Greatest weight 12 dwts. 6 grs.

Green Prolific (Hebburn's). See Hebburn's Green Prolific.

Green Rock. Green. Greatest weight 12 dwts. 9 grs.

Green Seedling. Green, hairy, oblong, small. First quality. Branches pendulous. Good bearer.

Greensmith. Green, hairy, roundish, middle size. Second quality. Branches erect.

Green Willow. Green, downy, roundish, large.

Third quality. Branches erect. Bad bearer. Greatest weight 19 dwts. 20 grs.

Green Willow. See Parkinson's Laurel.

Greenwood (Berry's). Pale green, smooth, oblong, large. Second quality. Branches pendulous. Good bearer. Greatest weight 18 dwts. 8 grs.

Gunner. Yellow. Greatest weight 23 dwts. 20 grs. Bears well. Second quality.

Haddingtonshire. White. Greatest weight 11 dwts. 2 grs.

Hairy Black. See Ironmonger.

Hairy green (Gerrard's). Green, hairy, roundish, middle size. Third quality.

Hairy Red (Barton's). Red, hairy, roundish, small. Second quality. Branches erect. Good bearer.

Hall's Seedling. See Woodward's Whitesmith.

Hawk. Yellow. Greatest weight 21 dwts. 8 grs.

Haywood's Defiance. Red. Greatest weight 15 dwts. 19 grs.

Heart of Oak (Massey's) Green, smooth, oblong, large. First quality. Branches pendulous. Good bearer. Greatest weight 17 dwts. 6 grs.

Hebburn green Prolific. Green, hairy, roundish, middle size. First quality. Branches erect. Excellent.

Hedgehog. See Irish White Raspberry.

Hero (Ambersley). Dark, red, smooth, oblong, large. Third quality. Branches spreading.

Hero (Kilton). See Hamlet's Kilton.

Highlander (Horsfield's). Yellow, downy, oblong, large. Third quality. Branches erect. Bad. Greatest weight 16 dwts. 3 grs.

High Sheriff of Lancashire (Grundy's). Green, smooth, obovate, middle size. Second quality. Branches pendulous.

Highwayman (Speechley's). See Glorious Bell.

Hit or Miss (Taylor's). Red, hairy, oblong, very large. Third quality. Branches pendulous. Coarse.

Honey (White). White, smooth, round, oblong, middle size. First quality. Branches erect. Excellent.

Hogg's Seedling. Green. Greatest weight 12 dwts. 1 gr.

Huntsman (Bratherton's). Speechley's Rough Robin. Dark red, hairy, roundish, large. Second quality. Branches erect. Great bearer. Greatest weight (1820) 25 dwts. 18 grs.

Husbandman (Foster's). Forester's Husbandman. Yellow, downy, obovate, large. Second quality. Branches erect.

Incomparable. White. Greatest weight 16 dwts. 7 grs.

Independent (Brigg's). Bigg's Independent. Green, smooth, obovate, large. Second quality. Branches erect. Good bearer. Greatest weight 18 dwts. 17 grs.

Invincible (Heywood's). Yellow, downy, round, oblong, large. Second quality. Branches erect. Greatest weight 17 dwts. 22 grs.

Invincible. Green. Greatest weight 25 dwts. 5 grs.

Irish Plum. Dark red, hairy, roundish, middle size. First quality. Branches erect.

Ironmonger. Hairy Black. Red, hairy, roundish, small. First quality. Branches spreading. Leaves pubescent; fruit more round and darker than that of red Champagne; a superior variety often confused with this.

Ironmonger. See Red Champagne.

Jackson's Slim. Dark red, downy, obovate, middle size. Second quality. Branches spreading.

Jagg's Red. Red, smooth, roundish, large. Second quality. Branches pendulous.

Jay Wing.

John Bull (Blomerley's). Yellow, downy, obovate, large. Second quality. Branches pendulous.

Joke (Hodkinson's). Green, downy, roundish. large. Third quality. Branches pendulous.

Jolly Angler (Colliers's). Collin's Jolly Angler. Lay's Jolly Angler. Green, downy, oblong, large. First quality. Branches erect. A good late sort. Greatest weight 17 dwts.

Jolly Cobler. Green. Greatest weight 13 dwts. 21 grs.

Jolly Farmer (Chapman's). Prince of Wales. Farmer. Green, smooth, oblong, large. Third quality. Branches spreading; greatest weight 17 dwts. 13 grs.

Jolly Gunner (Hardcastle's). Royal Gunner. Yellow, hairy, oblong, large. Third quality. Branches erect.

Jolly Miner (Greenhaigh's). Red, smooth, obovate, large. Third quality. Branches pendulous. Greatest weight 21 dwts. 14 grs.

Jolly Nailor (Bromley's). Greenish white, hairy, roundish, oblong, large. Third quality. Branches erect. Greatest weight 16 dwts. 11 grs.

Jolly Printer (Eckersley's). Eckersley's Jolly Painter. Dark red, smooth, oblong, large. Third quality. Branches spreading.

Jolly Tar (Edward's). Green, smooth, obovate, large. First quality. Branches pendulous. Good bearer. Greatest weight 16 dwts. 14 grs.

Juniper. Green. Greatest weight 15 dwts. 19 grs.

Jubilee (Hopley's). Dark red, hairy, roundish, large. Second quality. Branches erect. Greatest weight 22 dwts. 17 grs.

Keens's Seedling. Keens's Seedling Warrington. Very dark red, hairy, oblong, middle size. First quality. Branches pendulous. Good bearer; earlier than red Warrington; grows dwarf.

Kilton (Hamlet's). Kilton Hero. Greenish yellow, hairy, oblong, large. Second quality. Branches pendulous. Greatest weight 15 dwts. 5 grs.

King (Allcock's). Dark red, hairy, roundish, large. Second quality. Branches erect; greatest weight 15 dwts. 21 grs.

Lady Delamere (Wild's). Yellow, white, smooth, oblong, large. Third quality. Branches spreading.

Lady Lilford (Grundy's). See Woodward's Whitesmith.

Lady of the Manor (Hopley's). White, hairy, roundish oblong, large. Second quality, Branches erect. Greatest weight, 20 dwts. 2 grs.

Lancashire Hero. Red. Greatest weight, 17 dwts. 6 grs.

Lancashire Lad (Hartshorn's). Dark red, hairy, roundish, large. Second quality. Branches erect. Good bearer. Fruit very handsome. Greatest weight, 21 dwts. 14 grs.

Lancashire Lass. See Woodward's Whitesmith.

Langley green (Mills'). Pale green, hairy, roundish, large. Second quality. Branches erect. Greatest weight, 16 dwts. 15 grs.

LargeEarlyWhite. Greenish white,downy, obovate, large. First quality. Branches erect. Very Early.

Large White. White, downy, oval, middle size. Second quality. Branches pendulous. Early.

Large Yellow. Greenish yellow, smooth, obovate, middle size. Branches pendulous.

Late green. Green, downy, obovate, small. First quality. Branches erect.

Laurel (Parkinson's). Green Laurel, Green Willow (of some). Pale green, downy, obovate, large. First quality. Branches erect; good bearer; nearly a white, resembling Woodward's Whitesmith. Greatest weight 19 dwts. 1 gr.

Leader. Yellow. Greatest weight 28 dwts. 14 grs.

Lion (White). White, hairy, obovate, large. Third quality. Branches erect.

Lioness (Fennyhaugh's). White, smooth, obovate, large. Second quality. Branches pendulous.

Little John. Dark red, hairy, oblong, small. Second quality. Branches erect.

Little Red Hairy. See Rough Red.

Lively Green (Boardman's). Like Parkinson's Laurel. Greatest weight, 18 dwts. 5 grs.

London. Red. Largest known. Greatest weight (1841), 35 dwts. 12 grs. This was grown by Mr. T. Gibson, of Nottingham, and was considered "The Champion Berry of England," but, in 1845, Mr. Elliot, of Ounsdale, grew one, weighing 36 dwts. 16 grs.

Long Yellow. Green, yellow, smooth, oblong, large. Second quality. Branches spreading.

Lord Combermere. (Forester's). Yellow, smooth, obovate, large. Second quality. Branches spreading.

Lord Crew (Hopley's). Green, hairy, oblong, large. First quality. Branches erect. Greatest weight, 23 dwts.

Lord Hood (Tartlow's). Pale, green, smooth, obovate, large, third quality. Branches erect. Greatest weight, 12 dwts. 21 grs.

Lord of the Manor (Bratherton's). Red, hairy, roundish, large. First quality. Branches spreading.

Lord Suffield (Haywood's). Green, yellow, smooth, obovate, large. Third quality. Branches pendulous.

Lord Wellington (Howley's). Red, smooth, oblong, large. Branches spreading.

Lord Valentia. White, smooth, oblong, large. Third quality. Branches spreading.

Lovely Anne. Green, downy, oval, large. Second quality. Branches pendulous.

Magistrate (Diggle's). Red, downy, obovate, large. First quality. Branches spreading.

Magnum Bonum. Red. Greatest weight, 16 dwts. 14 grs.

Maid of the Mill (Stringer's). White, downy, obovate, middle size. First quality. Branches erect. Greatest weight, 15 dwts. 17 grs.

Major. Green. Greatest weight, 14 dwts. 14 grs.

Major Cartwright. Red. Greatest weight, 18 dwts. 19 grs.

Marchioness of Devonshire. White. Greatest weight, 17 dwts.

Marchioness of Downshire. White, hairy, oblong, middle size. Third quality. Branches erect.

Marquis of Granby. White. Greatest weight, 15 dwts. 1 gr.

Marquis of Stafford (Knight's). Red, hairy, round, oblong, large. Second quality. Branches spreading. Resembles Wilmot's Late Superb.

Matchless (Wright's). Dark red, hairy, oblong, middle size. Third quality. Branches pendulous.

Meager. Yellow. Greatest weight, 16 dwts. 17 grs.

Medal. Yellow. Greatest weight, 16 dwts. 9 grs.

Mermaid. White. Greatest weight, 15 dwts. 14 grs.

Merry Lass. Green, smooth, obovate, middle size. Second quality. Branches erect. Greatest weight, 16 dwts. 20 grs.

Merryman (Nuts). Pale green, downy, obovate, middle size. Second quality. Branches pendulous. Greatest weight, 17 dwts. 4 grs.

Midsummer. Green, smooth, roundish, small, second quality. Branches erect. Early.

Mignonette. Green, hairy, roundish, small. Second quality. Branches erect. Leaves pubescent.

Milkmaid. White. Greatest weight, 17 dwts. 9 grs.

Minerva. Green, smooth, oblong, large. Third quality. Branches spreading.

Miss Bold. Pigeon's Egg (of some). Red, downy, roundish, middle size. First quality. Branches spreading. Early. Allied to Red Walnut, but better.

Miss Hammond. White. Good bearer. Greatest weight, 24 dwts. 6 grs.

Miss Walton. White. Greatest weight (1845), 24 dwts. 19 grs.

Mogul. Red. Greatest weight, 20 dwts. 15 grs.

Moses (Lovart's). Green, hairy, obovate, large. Second quality. Branches erect.

Moss's Seedling. See Early Sulphur.

Moston Pile. White. Greatest weight, 15 dwts. 10 grs.

Mountaineer. Green. Greatest weight, 12 dwts. 9 grs.

Mrs. Clark. Green. Greatest weight, 16 dwts. 12 grs.

Murrey. See Red Walnut.

Napoleon (Saunder's). Yellow, smooth, obovate, large. Second quality. Branches pendulous.

Nelson. Green. Greatest weight, 14 dwts. 21 grs.

Nelson's Waves (Andrew's). Yellowish green, hairy, oblong, large. Third quality. Branches pendulous. Greatest weight, 22 dwts. 8 grs.

Noble Landlady. See Bonny Landlady. Greatest weight, 16 dwts. 22 grs.

No Bribery (Taylor's). Green, smooth, obovate, large. Second quality. Branches pendulous.

Nonpareil. See Green Walnut.

Nonsuch. Red. Greatest weight, 18 dwts. 12 grs.

Northern Hew. Green, smooth, obovate, large.

Third quality. Branches pendulous. Greatest weight, 14 dwts. 3 grs.

Nutmeg.

Ditto (of some). See Raspberry.

Nutmeg (Brawnlie). Red, smooth, obovate, small. Second quality. Branches spreading.

Nutmeg (Scotch). Red, hairy, downy, roundish. Second quality. Branches erect.

Old Ball.

Old England (Rider's). Dark red, smooth, round, oblong, large. Second quality. Branches pendulous. Resembles Wilmot's Early red.

Old Preserver. See Raspberry.

Old Scotch Red. See Rough Red.

Ostrich. White. Greatest weight, 24 dwts. 3 grs.

Overall. Green. Greatest weight, (1845) 25 dwts. 7 grs. Good bearer.

Ditto (Bratherton's). Red, hairy, oblong, large, second quality; branches pendulous; greatest weight, 22 dwts.

Pastime (Bratherton's). Dark red, hairy, roundish, large, second quality; branches pendulous; extra bracts often attached to the sides of the fruit; greatest weight, 20 dwts. 14 grs.

Patriot. Red. Greatest weight, 20 dwts. 2 grs.

Peacock. Green; greatest weight (1845), 26 dwts. 5 grs.; flavour resembling greengage plum; not a good bearer.

Peover's-pecker, Bell's. Dark green, smooth, obovate, large, third quality; branches pendulous; greatest weight, 19 dwts. 10 grs.

Perfection, Gregory's. Green, downy, roundish, large, first quality; branches, pendulous; late.

Phantom. Green; greatest weight, 14 dwts. 9 grs.

Philip the First. White; good bearer; greatest weight, 24 dwts.

Pigeon's Egg (of some). White, hairy, obovate, middle size.

Ditto. See Miss Bold.

Pilot. Yellow; greatest weight, 27 dwts. 5 grs.

Platoff. Green; greatest weight, 13 dwts. 22 grs.

Platt's White. Greenish white, hairy, roundish, small, first quality; branches, erect.

Ploughboy, Grundy's. Red; greatest weight, 16 dwts. 15 grs.

Polander. Red; greatest weight, 18 dwts. 22 grs.

Pollet's Seedling. Dark red, smooth, oblong, large. Third quality. Branches spreading.

Prince of Orange (Bell's). Yellow, downy, oblong, large. Second quality. Branches pendulous.

Prince of Wales. See Chapman's Jolly Farmer.

Prince Regent (Bordman's). Boardman's British Prince. Dark red, smooth, roundish, large. Second quality. Branches spreading. Greatest weight 24 dwts. 1 gr.

Princess Royal. Green, white, hairy, obovate, large. First quality. Branches pendulous. Good bearer.

Printer. Red. Greatest weight 20 dwts.

Profit (Prophet's). Green, downy, oblong, large. Second quality. Branches spreading.

Providence. Green. Greatest weight 21 dwts. 10 grs.

Porcupine (Henderson's). See Irish White Raspberry.

Purse. Yellow. Greatest weight 17 dwts. 7 grs.

Queen. Yellow. Greatest weight 18 dwts. 19 grs.

Queen Ann (Sampson's). Simpson's Queen Ann. Greenish white, downy, ovate, large. Second quality. Branches erect. Greatest weight 20 dwts. 6 grs.

Queen Caroline (Lovart's). White, smooth, obovate, middle size. Second quality. Branches erect.

Queen Charlotte (Peer's). Greenish white, hairy, oblong, middle size. First quality. Branches erect. Greatest weight 16 dwts. $12\frac{1}{2}$ grs.

Queen Mary (Morris's). Greenish white, downy, ovate, middle size. Third quality. Branches erect. Greatest weight 15 dwts. 22 grs.

Queen of Trumps. White. Greatest weight, (1845), 24 dwts.

Queen Victoria. Green. Greatest weight, 1845, 26 dwts.

Quoiter. Yellow. Greatest weight 15 dwts 1 gr.

Radical, Smith's. White, hairy, roundish oblong, large, second quality ; branches pendulous.

Ranger. Yellow, hairy, roundish, small, third quality; branches pendulous ; greatest weight 17dwts 16 grs.

Ranter. White. Greatest weight 14 dwts 3 grs.

Raspberry. (Old Preserver. Nutmeg of some). Darkish red, hairy, roundish, small, first quality ; branches spreading ; early.

Raspberry, Irish White. Henderson's Porcupine, Hedgehog. White, hairy, roundish, small, first quality ; branches spreading ; fruit very hispid.

Ratcliff. Green. Greatest weight 17 dwts 15 grs.

Ratcliff ringers. Red. Greatest weight 19 dwts 20 grs.

Rattlesnake. Yellow. Greatest weight 13 dwts 21 grs.

Red, Beaumont's. Dark red, hairy, roundish, middle size, first quality ; branches erect, leaves pubescent.

Red Mogul. Red, hairy, roundish, small, first quality ; branches spreading.

Red Ocean. Red. Greatest weight 16 dwts 17 grs.

Red Oval, Large. Red, hairy, oval, large, first quality ; branches spreading.

Red Rose. Red, downy, oblong, large, first quality; branches pendulous; very good.

Red Smith. Red, downy, oval, middle size; second quality; branches spreading.

Red. Thick-skinned. See Rough Red.

Red Tukey. Smooth Red. Red, smooth, obovate, small; first quality; branches spreading.

Red Turkey (of some). See Red Champagne.

Reformer. Green, smooth, oblong, large; second quality; branches spreading.

Regulator (Prophet's). Yellow, downy, roundish, large; second quality; branches pendulous.

Richmond-hill (Ward's). Dark red, smooth, obovate, large: second quality; branches pendulous.

Rifleman (Leigh's). Allcock's Duke of York, Yates's Royal Ann, Grange's Admirable. Red, hairy, roundish, large; first quality; branches erect; good bearer, late; greatest weight 17 dwts. 5 grs.

Ditto (London). Green, smooth, oval, middle size; third quality; branches spreading.

Ringleader (Johnson's). Red, smooth, oblong, large; second quality; branches pendulous.

Roaring Lion (Farrow's). Great Chance. Red, smooth, oblong, very large; second quality; branches pendulous; late, and one of the very largest; greatest weight, 1825, 31 dwts. 16 grs.

Robin Hood (Bell's). Yellowish green, downy, oblong, large; branches pendulous.

Rob Roy. Red, hairy, obovate, middle size; first quality; branches erect; very early.

Rockgetter. White; greatest weight 16 dwts. 2 grs.

Rockwood (Prophet's). An old sort. Yellow, hairy, roundish, large, second quality; branches erect, early, bears well; berry handsome; greatest weight 21 dwts. 3 grs.

Rodney (Acherley's). Red, downy, obovate, middle size, second quality; branches pendulous; allied to Red Walnut.

Rough red. Little Red Hairy, Old Scotch Red, Thick-skinned Red. Red, hairy, roundish, small, first quality; branches spreading; esteemed for preserving.

Ditto. New.

Ditto (Small Dark). Small Rough Red. Red, hairy, round, small, first quality; branches spreading, early, leaves pubescent; very good for preserving.

Rough Robin (Speechley's) See Huntsman (Bratherton's).

Ditto Yellow. See Sulphur.

Ditto White (Early). White, hairy, oval, large, second quality; branches erect.

Round Yellow. See Rumbullion.

Royal Ann (Yates's). See Leigh's Rifleman.

Ditto Duke. Dark red, smooth, obovate, large, third quality; branches pendulous.

Ditto George. Green, smooth, oval, middle size, second quality; branches erect.

Ditto, Early. Green, hairy, oblong, middle size, second quality; branches pendulous.

Ditto Gunner, Hardcastle's. See Hardcastle's Jolly Gunner.

Ditto Oak. Red, hairy, roundish, middle size, first quality; branches spreading.

Royal, Pearson's. White, downy, oval, middle size, second quality; branches spreading.

Ditto Rockgetter, Saunder's. Andrew's Royal Rockgetter. White, downy, obovate, large, second quality; branches erect.

Ditto white. White, hairy, round, small, first quality; branches erect.

Ruleall. Yellow; greatest weight 16 dwts. 4 grs.

Rumbullion. Yellow Globe, Round Yellow. Pale yellow, downy, roundish, small, second quality;

branches erect; great bearer; much grown for bottling.

Rumbullion, Green. Green, hairy, round, small, second quality; branches erect.

Sabine's green. Green, smooth, roundish, small, first quality; branches spreading.

Saint John. Red, smooth, obovate, middle size, second quality; branches spreading.

Samson. Red; greatest weight 16 dwts. 1 gr.

Scarlet, Transparent. Dark red, hairy, roundish, small, second quality; branches erect; bad bearer.

Scented Lemon, Rider's. Red, smooth, obovate, large, first quality; branches spreading; very good.

Scotch green, Green; greatest weight 12 dwts.

Scotch best Jam. Dumpling. Dark red, hairy, roundish, small, first quality; branches erect, leaves pubescent.

Scotch Lass. Green; greatest weight 12 dwts 12 grs.

Self-Interest. Yellow; greatest weight 15 dwts 6 grs.

Shakspeare, Denny's. Red, hairy, roundish, large, first quality; branches erect.

Shannon, Hopley's. Green, smooth, roundish, large, third quality; branches spreading; greatest weight 15 dwts 18 grs.

Sheba Queen, Crompton's. Compton's Sheba Queen. White, downy, obovate, large, first quality; branches erect; ripens early, good bearer; extremely near, if not the same as Woodward's Whitesmith; greatest weight 18 dwts 14 grs.

Shepherd. Yellow; greatest weight 15 dwts 10 grs.

Silversmith. White; greatest weight 11 dwts 10 grs.

Sir Francis Burdett, Mellor's. Light red, hairy, obovate, large, second quality; branches erect.

Sir John Cotgrave, Bratherton's. Dark red, hairy, obovate, large, third quality; branches pendulous; greatest weight 25 dwts 2 grs.

Sir Sidney Smith. See Woodward's Whitesmith.

Small green. Green, downy, globular, small, second quality; branches erect.

Small hairy green. Green, hairy, roundish, small, second quality; branches erect, leaves pubescent.

Small red. Red, hairy, roundish, small, first quality; branches spreading.

Smiling beauty, Beaumont's. Yellow, smooth, oblong, large, first quality; branches pendulous; good bearer, skin thin.

Smiling girl, Haslam's. White, smooth, roundish, oblong, large, second quality; branches erect.

Smithy-ranger, Fidler and Bullock's.

Smolensko, Greaves's. Red, smooth, oblong, large, second quality; branches pendulous; greatest weight 21 dwts 10 grs.

Smooth Scotch. See Small Red Globe.

Ditto green. See Green Walnut.

Ditto, Large. Green, smooth, obovate, large, first quality; branches spreading.

Ditto red. See Red Turkey.

Ditto yellow. Yellow, downy, roundish, small, first quality; branches erect.

Smuggler, Beardsell's. Yellow, smooth, roundish, oblong, large, third quality; branches spreading.

Snowball, Adam's. White, hairy, roundish, middle size, first quality; branches pendulous.

Snowdrop. White; greatest weight 11 dwts 12 grs.

Sovereign. Yellow; berry handsome; greatest weight 22 dwts 17 grs.

Southwell Hero, Smith's. Green; greatest weight 16 dwts 11 grs.

Sparklet. Greenish yellow, downy, obovate, small, second quality; branches pendulous.

Speedwell, Taylor's. Greenish white, hairy, oblong, large, second quality; branches pendulous.

Sportsman, Chadwick's. Dark red, smooth, obovate, large, second quality; branches spreading; greatest weight 20 dwts.

Squire Hammond, Lovart's. Red, hairy, roundish, large; greatest weight 23 dwts 20 grs.

Statesman, Billington's. Red; greatest weight 22 dwts.

Striped Green.

Striped Yellow.

Sugar-loaf. White; greatest weight 12 dwts 19 grs.

Sulphur. Rough Yellow. Yellow, hairy, roundish, small, first quality; branches erect; leaves not pubescent; greatest weight 11 dwts 20 grs.

Sulphur, Early. Golden Ball, Golden Bull, Moss' Seedling. Yellow, hairy, roundish oblong, middle size, second quality; branches erect, very early, and a good bearer.

Tallyho. White. Good bearer; greatest weight, 1845, 25 dwts 14 grs.

Tantararara, Hampson's Red, downy, obovate, middle size, first quality; branches erect, leaves pubescent.

Teazer. Yellow. Greatest weight, 1830, 32 dwts 13 grs; good bearer, very beautiful, first quality.

Thrasher, Yates'. Greenish white, smooth, oblong, large, third quality; branches pendulous, greatest weight, 30 dwts. 12 grs.

Thumper. Green. Greatest weight 29 dwts 12 grs.

Tim Bobbin, Clegg's. Greenish yellow, smooth, oblong, middle size, second quality; branches erect; greatest weight, 17 dwts. 3 grs.

Toper, Leigh's. Fox's Toper. Greenish white, downy, oblong, large, third quality; branches pendulous; greatest weight, 18 dwts.

Top Sawyer, Capper's. Pale red, hairy, roundish, large, second quality; branches pendulous, greatest weight, 1819, 26 dwts. 17 grs., berry handsome.

Trafalgar, Hallow's. Warwickshire Hero. Greenish yellow, hairy, oblong, large, third quality; branches pendulous, greatest weight 19 dwts. 13 grs.

Tramp. Green, greatest weight 18 dwts. 12 grs.

Transparent. White, greatest weight 14 dwts. 18 grs.

Trimmer. Dark red, smooth, obovate, large, third quality; branches pendulous.

Triumph, Ryder's. Green, hairy, obovate, small, third quality; branches spreading.

Triumphant, Denny's. Red, hairy, obovate, large, second quality; branches pendulous, greatest weight 23 dwts. 4 grs.

Troubler, Moore's. Green, hairy, roundish, oblong, large, second quality; branches spreading, greatest weight 15 dwts 16.

Trueman. Greenish white, hairy, obovate, large, second quality; branches erect.

Turnout. Green, greatest weight 23 dwts 14 grs.

Two-to-one. Yellow, greatest weight, 1845, 28 dwts.

Unicorn. Green, downy, oval, large, second quality; branches spreading.

Union. Green, greatest weight 13 dwts 13 grs.

Unknown. Green, greatest weight 13 dwts 21 grs.

Victory, Lomas's. Red, hairy, roundish, large, second quality; branches pendulous, much esteemed for cooking.

Victory, Mather's. Yellow, smooth, obovate, large, second quality; branches spreading.

Ville de Paris, Gradwell's. Greenish yellow, smooth, obovate, large, third quality; branches pendulous, greatest weight 17 dwts 17 grs.

Viper, Gorton's. Green, yellow, smooth, obovate, large, second quality; branches pendulous; greatest weight, 21 dwts. 2 grs.

Vittoria, Denny's. Greenish white, smooth, obovate, large, second quality; branches spreading; greatest weight, 17 dwts. 3 grs.

Volunteer. See Red Warrington.

Walnut, Green. Belmont's Green (of some), Smooth Green, Nonpareil. Dark green, smooth, obovate, middle size, first quality; branches spreading; great bearer.

Walnut, Red. Murrey, Eckersley's Double Bearing, Ashton Red (of some). Red, downy, obovate, middle size, second quality; branches spreading; early.

Walnut, White. Yellowish white, smooth, obovate, large, first quality; branches erect.

Wanton, Diggle's. Greenish white, smooth, roundish, middle size, second quality; branches spreading.

Warrington, Red. Aston, Aston Seedling, Volunteer. Red, hairy, roundish oblong, large, first quality; branches pendulous; one of the best late varieties; pulp clear.

Warrior, Knight's. Light red, downy, obovate, large, second quality; branches pendulous.

Warwickshire Hero. See Hallow's Trafalgar.

Waterloo, Sydney's. Green, downy, oblong, middle size, third quality; branches pendulous; greatest weight 13 dwts 6 grs.

Weathercock. Green; greatest weight (1845), 24 dwts 6 grs.

Wellington. Red; greatest weight, 16 dwts 6 grs.

Wellington's Glory. White, downy, roundish oblong, large, first quality; branches erect; skin thin and beautifully transparent; flavour excellent; tolerable bearer; greatest weight, 20 dwts.

Whipper-in, Bratherton's. Dark red, smooth, oblong, large; second quality; branches pendulous; greatest weight, 26 dwts 16 grs.

White Bear, Moore's. White, hairy, obovate, large, first quality; branches erect.

White Eagle, Cook's. White, smooth, obovate, large, first quality; branches erect; very late; most beautiful of all the varieties; bears well; excellent for preserving; greatest weight, 24 dwts. 9 grs.

White Heart, Nixon's. White, hairy, heart-shaped, middle size; third quality; branches erect.

White Lily. White, downy, obovate, middle size, second quality; branches erect.

White Lion, Cleworth's. White, downy, obovate, large, first quality; branches pendulous; a good late sort.

White Ocean. White; greatest weight, 15 dwts 7 grs.

White Rock. White; greatest weight, 17 dwts 14 grs.

White Rasp. White, smooth, round, small, second quality; branches spreading.

White Rose, Neill's.

White Rock, Brundrett's. Brundit's White Rock. White, smooth, obovate, large, third quality; branches pendulous.

Whitesmith, Woodward's. Whitesmith, Sir Sydney Smith, Hall's Seedling, Lancashire Lass, Grundy's Lady Lilford. White, downy, round, oblong, large, first quality; branches erect; excellent flavour, and a good bearer; greatest weight, 17 dwts 17 grs.

Wilmot's Early Red. Dark red, smooth, roundish oblong, large, second quality; branches pendulous.

Wilmot's Late Superb. Red, hairy, roundish oblong, large, second quality; branches spreading. Like Knight's Marquis of Stafford.

Wilmot's Seedling Red. Dark red, smooth, oblong, large, second quality; branches spreading.

Winter white. White; greatest weight, 15 dwts 8 grs.

Wistaston Green. Green; greatest weight, 14 dwts 9 grs.

Wistaston Hero, Bratherton's. Green, hairy, oblong, large, second quality; branches erect; greatest weight, 15 dwts. 16 grs.

Wistaston Lass. White.

Witherington. Red; greatest weight, 14 dwts 5 grs.

Wonderful. Red; greatest weight (1845), 32 dwts.

Woodman. Red; greatest weight, 17 dwts 7 grs.

Yaxley Hero, Speechley's. Red, hairy, obovate, large, first quality; branches erect; greatest weight (1818), 24 dwts 14 grs.

Yellow Beauty. Yellow; greatest weight, 11 dwts. 12 grs.

Yellow Hornet, Williamson's. Williams's Yellow Hornet. Yellow, downy, obovate, small, second quality; branches erect.

Yellow, Kelk's. Yellow, downy, oblong, middle size, second quality; branches erect.

Yellow, Old Dark. Yellow, smooth, roundish, small, second quality; branches erect; leaves pubescent.

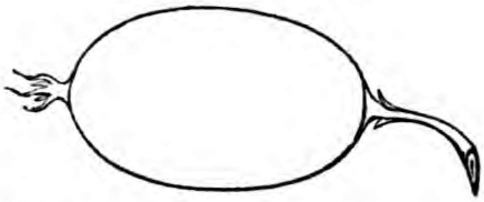
Yellowsmith. Yellow, hairy, roundish, oblong, small, first quality; branches erect; resembles Yellow Champagne.

Yellow, Waverham's. Yellow, downy, oval, middle size, second quality; branches pendulous.

York Lass. White; greatest weight 11 dwts.

York Seedling. See Glenton Green.

STANDARD OF MERIT.



Flavour. Rich and sugary.

Size. Not less than 18 dwts.

Form. If ovate, greatest diameter three-fifths of its extreme length; and if round, the nearest to a perfect globe.

Nose (Calyx) and Stalk. On slight elevations of the berry.

Skin. Very thin, yet not liable to burst. In the hairy sorts, the hairs slight and regularly disposed.

Colour. The purer the more desirable. No red or yellow gooseberry has its beauty more diminished than by being veined with green.

The time has now arrived when the raiser of gooseberries should aim primarily at flavour, for nothing further is desirable in the increase of size. If one gooseberry weighed 20 dwts., and another of 18 dwts. was equal to it in all other characteristics, but superior to it in flavour, I would award the prize to the latter. No one can grow gooseberries weighing 18 dwts. without great care and skill; and this being secured, the most desirable objects, beyond controversy, are their palateableness and culinary utility.

SOIL AND MANURES.

Although the gooseberry can be grown in almost any garden soil, yet, if excellence of fruit is desired, the soil must be a rich loam, not less than 12 inches deep, and resting on a well-drained yet cool subsoil. The plantation should be near the bottom, yet on the side, of a hill, and be unshadowed by trees, for if these intercept from them the light, the fruit will be neither large, nor full coloured, nor high flavoured. Whether to form an entirely new soil, or to improve that in which the plantation is to be made, the following compost, recommended by Mr. Haynes, may be advantageously adopted.

Of fresh or maiden earth from a light loamy rich pasture, take one whole spit-deep, with all the turf; to which add one-fourth of rotten stable litter, prefering that from an old hotbed made in the previous spring, which, from its softness and greater readiness to intermix with new soil, will be found preferable to every other; add one-fourth of the finest soft and black bog earth, or, in default of this, either the same quantity of the darkest coloured tree-soil (vegetable earth), prefering that from the more hard-wooded trees, as oak, ash, elm, or fruit-trees, or the same quantity of fully decayed tree-leaves; mix the whole regularly together, laying it in one narrow heap or ridge, about a yard high, in any situation exposed to the sun and air, there to remain six, nine, or twelve months, as circumstances may admit; turning over the whole every three weeks, the weather being favourable, that the entire heap may be thoroughly incorporated. The longer the compost remains in this state, the more advantageous it will prove. (*Haynes' Cult. of Gooseberry*, 79.)

This compost being formed early in the spring, and duly prepared by repeatedly turning over, will be in fit condition to apply when planting either in September or October. The gooseberry, like other trees, has its favourite or genial soil, and this is bog earth, applied in moderate quantity. It renders the soil open for the smallest fibres of this finely-rooted plant, and cool to promote increasing growth of the fruit during the summer months. Whoever has noticed the growth of the gooseberry in various soils and situations will have observed those growing on dry soils, however well cultivated, to have produced fruit of very inferior size, even when our summers have not been unusually warm. As a further proof that warmth, in conjunction with a dry soil, is unfavourable to the perfection of this fruit, it is well known that in the American State of New York, where the summers are more hot than in England, that the large fruited varieties taken from this country produce berries of such insignificant growth as not to merit culture; and the prize cultivators of this fruit in Lancashire prefer cool and rich soils. (*Ibid.*)

Mr. Levingston says that the soil should be trenched at least two spits deep, and strongly manured with composts or dung, according to the nature of the soil: if this be light, manure with cow-dung, pond mud, scourings of dishes, sprats, sea-ware, &c.; if the soil be cold and heavy, with stable-dung, pigeon-dung, soot, ashes, &c.; all of which are either to be used in composts or simple, but composts are to be prefered. If the new plantation ground be taken in from a pasture, it should be trenched full three spits deep, laying the top turf upside down, at the bottom of the trench. (*Growth of the Gooseberry*, 35.)

The soil for promoting the rooting and growth of cuttings should be prepared by removing the soil to the depth of three inches, and then putting in a layer of compost two inches thick, composed principally of decayed leaves, and on this an inch deep of the soil of the garden. In this bed the cuttings should remain two years, and instead of planting the trees in the common soil, and placing the manure over the roots, remove the soil to the depth of one foot or 18 inches, to be replaced either with Haynes' compost or a mixture of the soil of the garden, if good, with old stable manure, broken bones, and a considerable portion of decayed leaves.

Manures. These have already been noticed incidentally; and I have only to add, that in obtaining large gooseberries, *liquid manure*, formed of guano or pigeons' dung (and if of the guano, not more than half an ounce to each gallon of water), will be found very effective. Apply this in March, April and May. In the latter month it is a good plan to place mulch upon the surface over the roots of the trees; its fertilizing particles are washed down to them, and in dry weather it retains to them moisture. Soap-suds and the drainage from a dung-hill, in equal proportions, have also been employed beneficially as a liquid manure to the gooseberry.

PROPAGATION.

By Seed. This is the mode for obtaining new varieties. The seed must be taken from perfectely ripe berries, dried by spreading on a sheet of blotting paper, and sown immediately in pots of light loam, to remain in the greenhouse during winter, or be preserved in sand until February, and then sown. If kept unsown and dry until the spring the seed often remains without germinating for 12 months. The soil must be kept moderately moist until the seedlings are large enough to prick out in beds, which will be in October, and this removal must be into a rich moist soil in a warm situation. Seedlings will bear when three years old. There is no doubt that improved varieties might be raised by skilful hybridizing, but I am not aware that it has been adopted, the raisers usually being satisfied with the chance impregnated seed from some favourite variety. The Red Champaigne, if impregnated with pollen from the London, I believe, would yield offspring bearing very superior fruit.

Mr Levingston, nurseryman, Parson's Green, Middlesex, gives these directions for the culture of seedlings: Make the bed four feet wide, alloting two spare feet between each bed for the alleys, and with a wooden headed, or cuffing, rake draw and push the back of the rake evenly from one side of the bed to the other, moving the surface about one or two inches deep, and laying it up in a ridge at the extremity of each side of the bed. Sow the seeds regularly between the two ridges, and smooth it with the back of the spade; then with the front and back of the rake, draw back the surface earth regularly over the seeds, covering them about one inch deep, with the lightest and driest of the soil. The seedlings will soon appear above the surface, when they will require to be kept clear of weeds, and gently watered if dry hot weather. When they are about two inches in height thin them to about six or eight inches apart, and water when required until winter. *(Levingston on the Gooseberry)*.

The following year prune the seedlings to a clear stem twelve or eighteen inches in height, leaving only three, four, or five buds or eyes at the top of the stem to form the head. If dry weather continues, they will require gently watering frequently, to facilitate their growth. Keep them clear from weeds, and go over them at different times in the course of the spring and summer, displacing any suckers arising from the roots, or laterals from the stems. The third year, as the gooseberry bears its fruit principally on young shoots of the previous summer's growth, that wood is now to be left entire as there will be a likelihood of the plants having some fruit on the ensuing season, and which may be depended upon as a true specimen of its future merits. But if it should happen that the season should be wet, or the bush not in a good state of health, it may not bear any fruit until the following year; or if not vigorous, and the season is unfavourable for ripening fruits, an imperfect berry may be produced; in which cases the bush is not to be condemned until it has had a more favourable chance of proving itself another year. *(Ibid).*

Layering might be resorted to if the shoots are few in number and it is desirable not to risk the failure of a cutting; a risk, however, that is very trifling.

Suckers are rarely or never employed for propagating the gooseberry, because they have numerous adventitious buds low down towards the soil, from which, and perhaps from habit of growth, the plants thus raised are very liable to generate suckers. This is objectionable because the production of suckers robs the branches of sap which would have been devoted to their development and the production of fruit.

Mr. Levingston also deprecates raising plants from either layers or suckers, because, he says, by the first mode the bushes can hardly be obtained handsome, and by the second they are more liable to disease.

Cuttings are most usually employed for increasing desired varieties. The following are very good directions for their preparation. Shoots of the same year's production must be employed, and for the purpose, the best shoots are those that are fully ripened, robust, but not too strong. They are first to be deprived of about two or three inches of the point, and cut into lengths of ten inches or a foot, according to the size and strength of the shoots. Then, with a sharp knife, divest each shoot of the whole of its buds, excepting three or four nearest the top of the cutting, which must be left to form the branches of the future plant. Rubbing off the buds is not sufficient; they require to be picked out, or pared very close, to prevent them from throwing up suckers. The small buds towards the base of the cutting are always the most troublesome in this respect, and great care should be taken to remove them effectually before the cutting is inserted in the ground. Immediately underneath the part which the lowest bud occupied, make a clean horizontal cut without displacing any portion of the bark, and the cutting is then complete. Insert the cuttings in rows a foot apart, six or eight inches asunder, and two or three inches deep, pressing the earth firmly round them, either with the hand, or by placing one foot on each side of the row and treading it from one end to the other. (*Gard. Chron.* 1841. 732.)

The removal of the buds from the lower portion of the cutting should be done very effectually, and Mr. D. Cameron is quite right in his recommendation, that they should be cut clean out of the solid wood, much in the same way as a bud is taken off for inserting in a stock. A sharp knife, and a little experience, will enable the operator to make cuttings in this way as expeditiously as by the usual method, if only cutting the buds clean off without wounding the stem. At the base of the buds are sometimes left, by the usual method, the embryos of future buds, which in time become suckers. (*Ibid,* 102.)

The emission of roots from the cuttings is promoted in various ways, and the earlier this emission is produced the better, because the sooner and more effectually does the growth of the future shrub commence. This protrusion of roots is induced by removing, in the beginning of August, a ring of bark from the lower part of the shoots intended for cuttings; a callus soon forms, and by applying wet moss or soil to the part, roots are readily emitted. In September, when nearly all the leaves are fallen, cut them from the trees and plant them; and, as soon as all the leaves have fallen, prune them back to the three or four buds which are intended to form the branches, and, of course, all buds below these must be carefully cut out. (*Ibid.* 1842. 84.)

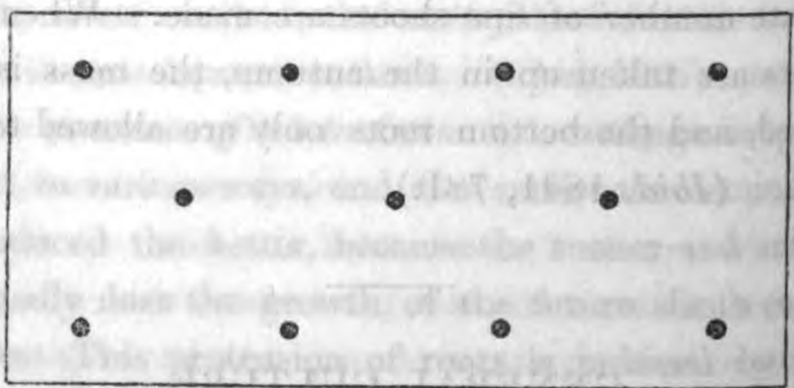
If the above plan is not adopted, Mr. R. Lymburn, of Kilmarnock, states, that the cuttings (in winter) always succeed best when the articulation, or socket, that joins the young branch to the old, is pulled out along with the cutting, when separated from the bush. If thus extracted from the parent shrub, and planted in a situation shaded from the mid-day sun, these slips will root if planted in July and August. When planting, a small quantity of wet moss is tied on the bottom of the cutting, which induces roots to develop themselves abundantly, and thus a proportionate number of fine shoots are made. When the plants are taken up in the autumn, the moss is removed, and the bottom roots only are allowed to remain. (*Ibid.* 1841, 781.)

GENERAL CULTURE.

Planting. The preparation of the soil has already been noticed in a previous section, therefore I have only to observe here upon the insertion of the shrubs. The gooseberry, like most other trees and shrubs, succeeds best with its roots growing near the surface. Shallow planting, therefore, has to be adopted; and I quite assent to the following directions given by Mr. Levingston.

Plant the bushes in an upright manner, and not deeper than just to cover the top part of the roots, about two inches below the surface; spread these out regularly and unentangled, taking care to shake the plant regularly as the earth is falling round the roots, that it may completely surround them, and place them in a sound, proper bed, giving them a gentle tread with your foot, and a little water to moisten the soil if it be dry. (*Levingston's Growth of the Gooseberry*, 36.)

The bushes are best planted in a quincunx order, thus—



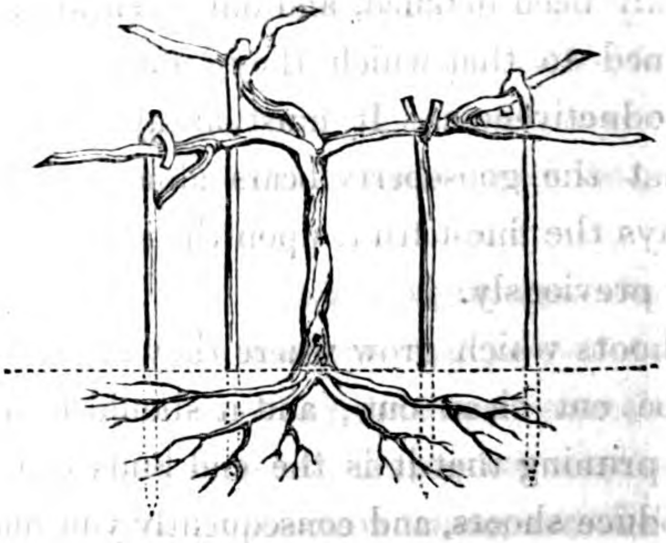
and the rows six feet aoart, and at the same intervals in the rows.

Pruning. The pruning necessary for young plants has already been detailed, and our attention may now be confined to that which they require to promote their productiveness. It must always be borne in mind that the gooseberry bears almost exclusively, and always the finest fruit, upon the shoots produced the year previously.

All shoots which grow where they are not wanted should be cut clean out; and it should be borne in mind in pruning that it is the end buds which generally produce shoots, and consequently you may make a shoot grow in any direction you please by cutting the wood back to a bud which points in that direction. (*Gard. Chron.* 1842, 84.)

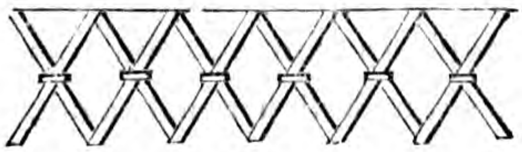
After these general directions, we may proceed to more particular details, of which the best have been furnished by Mr. Saul, one of the principal Lancashire gooseberry cultivators. He says—

As all the fruit grows from the underside of the branches, the plan adopted for first putting the tree in a training state, is to have a few hooked and forked sticks, the former to hold down the branches that are inclined to grow upwards, and the latter to support those which are inclined to grow downwards. The plant in the sketch on the next page has been trained by such sticks. It consists of three shoots spreading regularly, and nearly horizontally outwards. Next autumn these three shoots will have produced side shoots most of which may be shortened to one eye, and the



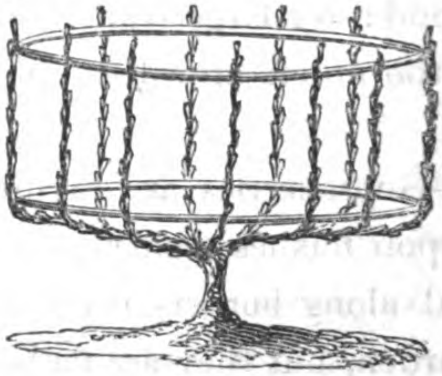
others reduced to one half of their length. No shoots should be left either at the origin or the extremities of the branches, but only at the sides; the fewer the number of shoots, and the younger the tree, the larger will be the fruit. At the next pruning season, viz. November, the tree will consist of the three principal shoots, each bearing two young shoots shortened to about 7in. of their length; these last, in the succeeding year's pruning, are to be left with two shoots only of new wood; all other shoots are to be closely cut out; and, in leaving the young shoots for bearing, regard must be had to keep the whole in a regular and handsome form. In all following years, the system of pruning and thinning is to keep a moderate and constant supply of strong healthy young shoots, from which alone can be expected large and fine fruit; and, when the extremities grow beyond the proper bounds, such branches should be cut back, so as to keep the tree in a compact form, and furnished sufficiently, though rather thinly, with new bearing wood: for large fruit cannot be expected if the tree is too much crowded. (*Gard. Mag.* iii. 421).

Espaliers.—Gooseberries are highly improved by being grown upon bushes trained as espaliers, which may be planted along borders near the side walks of the kitchen garden, but they are far better grown in a separate compartment. For these the trellis must not be higher than three feet from the ground, and for the purpose stakes about four inches in circumference, and thus arranged, are very suitable:—



Various suggestions have been made for altering the form of espalier trellises, but let the gardener never adopt any that declines from the perpendicular. The smallest approach to the horizontal increases the radiation of heat from the trees, and increases, consequently, the cold they have to endure at night. It is not one of the least advantages of training gooseberries and currants as espaliers, that it facilitates the protecting them with mats.

Although on the borders the bushes are best trained to stakes arranged lozenge-wise as above, yet in separate plantations they are preferably trained round hoops in this form.



Wall-training.—Upon this branch of gooseberry culture, I have no better information to offer than is contained in the following very correct observations of Mr. Levingston, premising, however, that when so grown the fruit is forwarder, handsomer, and better flavoured than if grown upon standards.

Gooseberries do well trained against walls and palings; the proper kinds for this purpose being the largest and most early sorts, such as the (Red) Crown-bob, Huntsman, Top-sawyer; (Yellow) Nelson's-waves, Viper, Rockwood; (Green), Ocean, Laurel, Independent; (White), Smiling-beauty, Wellington's-glory, and Eagle. Plant them about six feet apart, in an open situation, where they can have the full benefit of the sun and air; but if there is not a low wall in a good situation about the premises, they may be introduced into vacant spaces at the under parts of the wall, such as between rider trees.

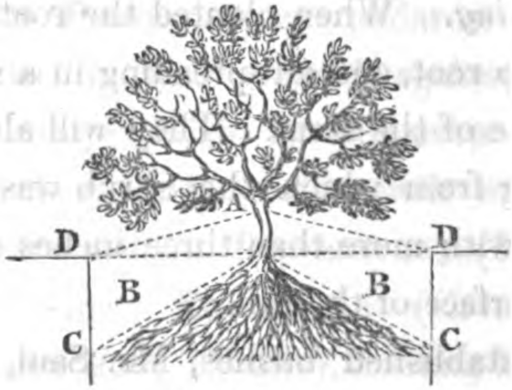
Train them to the wall, &c., in a fan shape; keep them regularly pruned and dressed to the wall; and in every winter's pruning, observe to cut out all old wood, and retain as much of the young as is necessary, laying in the young shoots at full length, and at regular distances from each other. Look over them at different times during the spring and summer, and remove a great portion of the over-abundant young wood, and nail in the remainder, that they may not shade the advancing fruit. Give them gentle waterings in hot weather during the summer, until within about a fortnight of the fruit being ripe; after which the less moisture they have the better will be the flavour of the fruit. (*Levingston's Growth of the Gooseberry*, 40.)

Root-pruning. When planted the roots should be without a tap root, and all spreading in a single whorl from the base of the stem. They will always do so if the cutting from which the shrub was raised was not planted with more than three inches of its length below the surface of the soil.

Of the established bushes, Mr. Saul, already noticed, says—

The roots should be pruned every two or three years. When a root, therefore, has extended too far from the stem, let it be uncovered, and all the strongest leaders shortened back nearly one half of their length, and covered in with fresh marly loam. This will cause new and more active roots to be formed nearer the stem, and give the whole tree new vigour. (*Gard. Mag.* iii. 422.)

There is a continual tendency on the part of the under-ground buds to become branches, and these are the suckers that we find so troublesome in many kinds of soils. By continually stopping and wounding them, however, they will, in general, perish; and to do this is what we recommend. The Lancashire gooseberry growers adopt the following as the best means of preventing gooseberries from throwing up suckers, and also an excellent plan of insuring an abundance of large fruit. In the sketch, A is the bush, B B is the soil taken out about eighteen inches all round the plant, and about six inches deep at C,



that if there are any buds or suckers, they are sure to be seen and destroyed. This do every year in December, and as soon as the soil is taken out, spread cowdung over the roots as shown at B, after which replace the earth that has been taken out. When you have any new seedlings to propagate, do not take out the soil, but lay the manure round them, and cover it with a layer of earth which encourages the plant to produce suckers. Raising from suckers, however, is not a mode of propagation of which I approve.

Fruit.—This should be thinned, the smaller berries being cut away with a pair of scissors for tarts, &c. as required, and the fine berries left for dessert. If some of reds, as the Warrington, and of the thick skinned yellows, as the Mogul, are matted over when the fruit is ripe, they will remain good until Christmas. This is easiest done when the tree is grown as an espalier.

Large Fruit. In Lancashire, where premiums are given for large gooseberries, without consideration of their table excellencies, the growers suffer only two or three to remain on each branch, and then, by supporting a saucer under each of these, bathe them for some weeks in so much water as to cover about a fourth part of each berry, which they call appropriately, though not elegantly, "*suckling the gooseberry.*"

Great attention and judgment are required to attain the effect desired from this practice, for if kept in the water too long, and at a time when ripeness is far advanced, the berries are liable to burst, or "to coddle," which is an ulceration arising from excessive moisture. To prevent the access of too much moisture to gooseberries ripening and intended for exhibition, the growers shelter them as assiduously as the florist shades his flowers, and this is absolutely necessary, for when nearly ripe a very slight wetting of the berry's skin causes its bursting.

Autumn Dressing.—At the time of this season's pruning it is highly beneficial to brush the stems, and syringe the bushes with a strong brine of common salt. This destroys moss and the larvæ of insects, as well as gives a salutary stimulus to the bark.

Mr. J. Naismith, gardener at Culloden House, adopted a somewhat similar treatment, though with a less simple liquid. He says—

As soon as the leaves are all fallen, begin pruning and dunging, if necessary, then dig the ground between the bushes, leaving the ground as rough as possible; and as the diggers proceed, that is, as soon as they are clear of the first plant in the row, give the bush, from the rose of a water-pot, at least an English gallon of a mixture, in equal parts, of lime-water, chamber-ley, and soap-suds, in which is mixed as much soot as gives the composition the colour and consistence of rich dunghill drainings; proceeding over the whole in this manner, without treading or poaching the ground. When the winter frosts are fairly past, level and dress the ground between the shrubs with the rake. (*Cal. Hort. Soc. Mem.* ii. 90.)

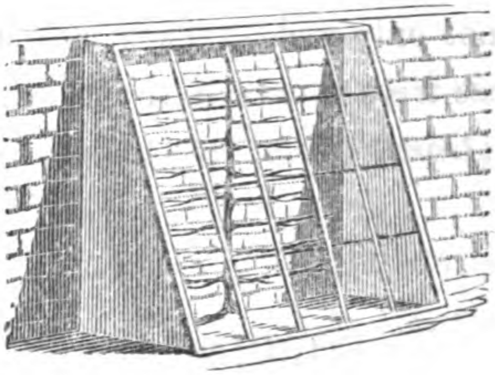
The following is another application, of use in protecting the buds of gooseberries from the ravages of birds in the winter and spring months, as well as like the last, being effectual for clearing the bark of fruit-trees, generally, from moss, lichens, and the larvæ of insects. Take unslacked lime and soot, in equal quantities, add cow's urine until the mixture has attained the consistency of thick paint. Paint the trees regularly over with the mixture, and the result will be not only a clean bark, but an increased vigour in those trees to which the mixture has been so applied. (*Gard. Chron.* 1841. 85.)

FORCING.

Neither the gooseberry nor currant can be forced without great care. No heat must be applied when they are first put under glass. A very low temperature, about 60 deg. and not higher than 40 deg. at night, must be employed afterwards, otherwise an excess of leaves and weak shoots are produced, but no fruit. When the fruit is well grown the temperature may be increased about 10 deg. For this purpose the plants to be forced are best grown in pots, small three year olds being selected, and placed in them at the end of October. In January move them into the peach house, and by careful treatment fruit will be ripe upon them in the course of April. The bush and its fruit may be sent to table.

Rifleman, Rumbullion, and Wilmot's Early are the best varieties for forcing.

To bring the fruit forward for tarts, the Rumbullion may be grown against a south wall, and sheltered with a glass case of the following form. The berries will be fit for the desired purpose in the course of March.



With a hinge at each of the upper corners, the light may be opened whenever air is desired to be admitted; the angle at which the glass is placed allows the inlet of more rays of light than if it were perpendicular; and being in form very like a common garden-frame, it may be so employed at all other seasons of the year.

This shelter need not be put over the shrub until the first week of January. In fine mild weather, the shrub may be sprinkled with tepid water, and the glass opened to admit air, but kept carefully closed at night, and during frosty weather.

DISEASES.

Blistering of the leaf occurs occasionally, but not so frequently as to the currant. It arises from the parenchyma of the leaf swelling to a size not containable between the surrounding nerves or ribs of the leaf, and appears to be caused by the roots supplying more sap than the leaves can elaborate, and the blister rises in the effort made to increase the surface of leaf. The blister becomes red because an acid is formed by fermentation from the juices of the leaf mixing, owing to their rupture of the containing vessels. The disease is so circumscribed in its occurrence, and attacks so few leaves, that it is of little consequence, and does not require the adoption of any remedial treatment. If the blisters were ever to appear excessively, they would probably disappear by pruning in the roots as recommended in a previous section, and by well draining the soil. This is an effective remedy for a very similar disease affecting the peach leaf.

Coddling is an ulceration of the berry. It arises from excessive wet, for it is never found on a well drained soil, nor in very dry seasons. Sometimes the skin of the berry bursts, but as often the rupture is confined to its interior vessels, in consequence of which the mucilaginous and saccharine juices mingle, and decomposition ensues. The progress of this is apparent from the white coddled discoloration visible through the skin, on the side where the disease is progressing. At first the sugar of the berry decreases and a little alcohol is developed, imparting to it a vinous flavour, but this is rapidly followed by acetous fermentation, and eventually mouldiness and putrefaction destroy it. Good drainage of the soil, and sheltering the bushes from excessive rain, are the preventions of the disease. There is no cure for it when it does appear.

INSECTS.

MANY are the insect marauders of the gooseberry, but the following are those of which we are chiefly cognizant:

Aphis ribis is a species of louse, preying both on the gooseberry and red currant. Its colour is blackish; and, like all other aphides, is injurious by its multitude; for although each consumes but a minute quantity of a plant's sap, yet, when thousands unite in their attacks, they very seriously injure its growth and prevent its developments. Even when fewer in number their excrements clog the pores of the leaves, and render the fruit disgusting. The most effectual mode of destroying them is to cover the infected bush with a sheet or other large envelope that will reach to the surface of the soil on all sides, and then to fumigate it with tobacco smoke.

The following are the best modes of fumigating; the first mode being the speediest, and the second the cheapest.

One or more pieces of cast iron, one inch thick, and three inches over, are to be made red hot (pieces of old tiles, such as are used for covering smoke flues, would probably answer equally well); and one of these beiug placed in a twenty-four sized pot, put on it the fourth of an ounce, or other quantity, of tobacco considered necessary to charge the space within the envelope with smoke sufficient to destroy insect life. This mode has these advantages—the tobacco is so quickly consumed, that the envelope is completely filled in a very short time, and but little smoke can escape before the insects are destroyed, the pure heat from the heater prevents injury from gas, and as no blowing is required there is no dust.

Another very simple mode of fumigating is as follows:—Dissolve a table-spoonful of saltpetre in a pint of water; take pieces of the coarsest brown paper, six inches wide, and ten inches long, steep them thoroughly in the solution, dry them and keep till wanted. To fumigate, roll one of the pieces into a pipe like a cigar, leaving the hollow half an inch in diameter, which fill with tobacco; twist one end and stick it into the soil; light the other, and it will burn gradually away for an hour or more.

Tobacco smoke should not be admitted to fruit trees when in bloom, nor when the fruit is ripening, as it imparts to them a flavour. (*Johnson's Dict. Mod. Gard.*)

Tenthredo Grossulariæ.—Mr. Curtis says, that this saw-fly was described, in 1823, by a French author, Le Pelletier de Saint Fargeau, under the name of *Nematus Trimaculatus;* and it is also called *N. Ribesii.*

The fly is of an ochreous colour; the antennæ are almost as long as the body, setaceous, brown above, and nine-jointed, the two basal joints being small; the crown of the head, the eyes, three large united spots on the centre of the trunk, as well as a large patch on the breast or sternum, are black; the body is orange, sometimes bright; the wings, which expand two-thirds of an inch, are iridescent; the reticulated nervures, the thickened costal edge of the superior wings, terminated by a callus spot, called the stigma, are brown; as are also the tips of the hinder-shanks, and their tarsi, or feet. The flies emerge, unheeded, from their tombs the beginning of April, and the female soon deposits her eggs close to the sides of the principal nervures on the underside of the leaves, which is very remarkable, for all the females of this extensive family are furnished with an instrument called the saw, for the purpose of cutting into the leaves and stalks, and introducing the eggs between the cuticles, or under the bark.

In about a week, the larvæ hatch, and commence feeding on the leaf on which they are stationed, and soon riddle them full of small holes; thus they go on feeding and changing their successive skins as they increase in size, until they are three-fourths of an inch long, when they are seen scattered round the edges of a partly-demolished leaf, holding by their fore legs, with their tails turned up, or lying on one side. At this time they are dull pale green; the first thoracic segment is deep yellow, and the penultimate of the same colour; the head, feet, and tail, are black, and each segment is dotted with the same colour, some of them having twenty-four spots, ranged in rows, down the back, those on the sides being more irregular, and one near the base of each foot is large; every one of these black tubercles produces a hair; they have six pectoral, sharp, horny feet, with which they always hold fast; the fourth segment seems to be destitute of feet, but the six following are each furnished with a pair of fleshy legs, which assist them in walking, and there is a similar part at the extremity of the last segment. There seems to be a succession of broods, from the early spring until October, occasionally; but the greatest numbers are congregated in May, and in the beginning of June.

Having defoliated a bush, leaving nothing of the leaves, excepting the footstalks, and sometimes a portion of the main rib, and being arrived at maturity, they cast their skins again, and then lose all their black spots, becoming of a uniform pale green, with two little black dots on the head, the spaces behind it and towards the tail retaining the yellow tint.

After resting awhile, they descend into the earth, and spin a yellow-brown cocoon, formed of silk and gluten, of so thick a texture that it is impervious; from these the summer broods of flies come up in less than three weeks, but the autumnal ones remain in them, curled up in the larvæ state, until the following spring, when they change to pupæ in time to produce flies, as the currant and gooseberry trees are coming into leaf. There are two modes of proceeding to rid our gardens of this terrible scourge; to catch flies, or search for the eggs and cut off the infested leaves, is scarcely practicable: our plan is, therefore, to look for the caterpillars; for, small as they are at first, they are easily detected by the perforated leaves, and when half-grown they are visible enough, and after that period they commit the greatest havoc, having inordinate appetites, and scarcely ceasing from their gluttony, except when their jackets become so tight that they are obliged to change. Hand-picking is, therefore, attended with great success in small gardens, but in plantations it is easier to sprinkle strong lime-water, as it is termed, over the leaves, which will destroy the caterpillar; or syringe the bushes well, and then dust them with quicklime, having previously laid a good quantity round the stem, to prevent their re-ascending the bush: it is said, also, that water, heated to 140 degrees Fahren., and thrown forcibly upon the bushes, through the rose of an engine or watering-pot, will kill the larvæ, without injuring the tenderest leaves on the bushes. The other method alluded to is, to destroy the pupæ; and this seems to be best effected by scraping away the earth from the roots early in the spring, and drawing it into a deep trench between the bushes, covering it over, and trampling it well down. If boiling hot water be used, either in autumn or spring, to kill the pupæ, it should be put on the earth when it is quite dry; the soil must be lifted two inches, and returned as soon as the water is poured in, that, as the heat passes off, it may destroy the animals encased in their shells. (*Gard. Chron.* 1841. 548.)

White Caterpillars, otherwise called *Borers,* are not so numerous as the other kinds, though very destructive. They bore the berry, and cause it to drop off. They preserve themselves during the winter season in the chrysalis state, about an inch under ground, and become flies nearly at the same time with the last-mentioned kind. They lay their eggs on the blossoms, and these eggs produce young caterpillars in May, which feed on the berries till they are full-grown, and they creep down into the earth, where they remain for the winter in the pupa state. (*Caled. Hort. Soc. Memoirs*, i. 102.)

Phalæna (Abraxas) Grossulariata. Mr. Curtis observes that this is one of our most striking and beautiful "Geometræ," and commonly known as the "Magpie" moth. There are few gardens where it may not be seen flying in the evening, towards the end of July, or resting with its wings closed under a leaf or against the side of a wall during the day. After pairing, the females lay their eggs upon a leaf, from which the little looping caterpillars hatch in September; and, living through the winter, they begin to feed again in the spring, and are not full-grown until the third week in May, and sometimes it is the end of June before they become pupæ; in about three weeks from that time the moths appear, and are consequently found from the middle of June to the end of July, or later, according to the temperature of the season. When these larvæ abound, which they mostly do on bushes, under old walls or hedges, they frequently strip the red currant and gooseberry bushes of their leaves, nothing but the footstalks being left. They will sometimes attack the sloe, and even the peach and almond tree. It is a handsome caterpillar when full-grown, forming a graceful loop as it walks, from which circumstance such insects have been called Geometræ: it is slightly hairy, of a cream colour, spotted with black, having orange spots down the sides, so that it greatly resembles the moth in colour, which is very unusual. Having arrived at maturity, it spins a web, so loosely constructed that sometimes the pupa falls out; it is either attached to the twigs, or concealed in crevices in walls, palings, &c. The chrysalis is shining black, with a few orange rings round the segments of the body. The moth is of a cream colour, the spots black; the thorax and abdomen, a space near the base of the upper wings, as well as an oblique stripe beyond the centre, are of a fine orange colour; the horns are a little the thickest in the males, but not pectinated, as is often the case in this family. (*Gard. Chron.* 1841, 515.)

Phalæna Vanaria is smaller than the preceding, and, like it, abundant in our gardens during June and July. The horns of the male are pectinated; the wings are of an ash colour, and freckled; the upper have four brown marks on the superior margin; the second crossing the centre of the wing, and forming a V or L. The larva is a looper, having only ten legs; it infests the red currant and gooseberry bushes, feeding upon the leaves, and is found in May. It is about an inch long, bluish green, with two white dorsal and two yellow lateral lines; it is dotted with little black tubercles, which produce short black hairs;

it changes late in May to a chesnut-coloured chrysalis in a slight web, on the surface of the earth. As the young caterpillars are brought to life almost as soon as the leaves unfold, they are often as injurious as those of the magpie-moth. They may also be collected by hand-picking; but as they undergo their metamorphoses upon the earth, lime and hot water may be employed. (*Ibid*. 516.)

For the destruction of the caterpillars, fumigation with tobacco, as detailed for that of the aphis, may be effectually adopted, besides which the following modes have been suggested.

Mr. James Jackson says, in the month of February or March put under each gooseberry bush a piece of unslacked lime about the size of a turnip, pour water on it, and as soon as the lime separates mix it regularly with the earth under the bush so low as the roots. More is not necessary, nor will it be requisite (in general cases) to repeat the lime for three or four years. The fact is, the butterfly deposits its eggs during the summer under the bushes, which eggs the lime destroys. The lime should invariably be used before the leaves begin to make their appearance. (*Gard. Chron*. 1841, 366.)

Lime applied as above may prevent the moth depositing its eggs, or may destroy these and the pupæ within the soil, but it cannot prevent the moth laying her eggs upon the leaves. To destroy the caterpillars when hatched, white hellebore (*Veratrum album*) is most effectual, and may be employed in the following modes.

Mr. Groom, florist, Walworth, says, make a strong decoction of the root of the white hellebore, with some green tops of the elder; one pound of the hellebore-root and a good handful of elder-tops to one gallon of water. By syringing the trees with the liquid when cold, it will kill the caterpillars. Mr. Groom says the day should be fine, that the liquid may be dried on the leaves, as the caterpillars are destroyed by eating the leaves on which the poison has dried.

This theory seems erroneous, inasmuch as from the following statement made by Mr. Lymburn, it appears that the mere contact of the powder of the hellebore with the skin of the caterpillar causes its death.

The way to use it, is while one of the men holds up the branches and exposes the under side of the leaves, to dust the caterpillars with powder from the finger and thumb, wherever the caterpillars are to be seen; if the powder is dry, and if not it should be toasted before the fire, it is dispersed into a cloud, and wherever a particle reaches the caterpillars, they may be seen to collapse as if stabbed, and in an hour or two nothing but the skin is left. Some prefer dusting up from below with a puff, without examining where the caterpillars are, by which there is more waste of powder and less trouble. *(Gard. Chron.* 1841, 533*)*.

Mr. J. Mackray, gardener at Errol House, gives the following as an effectual receipt: boil $\frac{1}{4}$lb. of tobacco with 1lb. of soft soap in about 18 Scots pints of water, and keep stirring the liquid while boiling with a whisk in order to dissolve the soap; this liquor when milk-warm, or so cool as not to hurt the foliage, apply to the bushes with a hand-squirt in the evening. The soap adheres to the leaves longer and closer than tobacco juice alone would do. (*Cal. Hort. Soc. Mem.* i. 272).

Mr. S. Elliot, gardener to Sir T. G. Carmichael, recommends the following compound for the same purpose: six pounds of black currant-leaves and as many of elder-leaves, boiled together in twelve gallons of soft water; put fourteen pounds of unslacked lime into twelve gallons of water, mix the two liquids together, and wash with the mixture the infested bushes and trees by means of the hand engine; after that is done, take a little hot lime and lay it at the root of each bush or tree that has been washed; which completes the operation. The caterpillars are thus destroyed without hurting the foliage of the bush. A dull day is to be preferred to any other for washing. When the foliage is all off the bushes and trees, wash them over with the hand engine to clear them of decayed leaves; for this purpose any sort of water will do. Then stir up the surface of the earth all round the roots to destroy the eggs. The above mentioned proportion of leaves, lime and water, will serve for two acres of ground or more, covered with bushes in the ordinary manner, and will cost very little. *(Cal. Hort. Soc. Mem.* i. 266).

USES.

The gooseberry is chiefly cultivated as a dessert fruit, and for that purpose some of its varieties are most excellent. When grown with a sole attention to the increase of the size of the berry, this is very frequently rendered a mass of insipidity, but great increase of size and extreme lusciousness of flavour are not at all incompatible, for I have tasted the Pitmaston Greengage Gooseberry and the White Eagle, grown against a wall, the first weighing more than 12 dwts., and the second over 20 dwts., yet rivaling in flavour and lusciousness many fruits of much higher pretensions.

The gooseberry is also used in the preparation of many kinds of confectionery, both when unripe and ripe, and in the former state it is preserved in bottles for winter use in tarts. It is also employed for the manufacture of vinegar, spirit, and wine. On this last use, as being most nearly connected with the cultivator's art, I will append the following observations from the pen of Dr Macculloch.

The gooseberry is one of the fruits most commonly used, and is in particular well known as an ingredient in brisk wines, which are made to resemble, in appearance at least, the wines of Champagne. For this purpose it is used in an unripe state. It is well known in the wine countries that, independently of some other causes of briskness, this property always results ftom the use of unripe fruit, and is readily produced by mixing unripe grapes with the ripe ones. The case is the same with the gooseberry. The fault of this wine, however, if it be considered as an imitation of Champagne, is a bad flavour, which is almost invariably communicated by the fruit, and that in proportion to its ripeness. To avoid this evil, so generally injurious to the brisk gooseberry wines, the fruit can scarcely be taken in a state too crude, as at this period the flavouring substance has *not* been developed. At the same time, the expressive juice alone should be used, care being taken to exclude the skins from the fermentation, as being the part in which the flavour principally resides. With these precautions, the noxious flavour may generally be prevented. It is true, that the produce is then without flavour, or nearly so, but this is by much the most tolerable fault in domestic wines, whose leading defect is almost invariably a disagreeable taste. Various proportions of fruit and sugar are used by different persons; but the most common consist of 3lbs. of sugar and 4lbs. of fruit, to 8lbs. of water. Here the proportion of fruit is too small compared to that of the sugar, and the fermentation is consequently, in general, so imperfect as to leave the wine disagreeably sweet. At the same time, the proportion of sugar is such as to render the wine stronger than the strongest wines of Champagne. If, therefore, this wine is to be amended in composition, it is either by reducing the sugar, if we are contented with a weaker wine, or by increasing the fruit, if we are desirous of retaining the greater strength. In managing the fermentation to a constant and successful result, the rules laid down as practised for Champagne wine are strictly applicable in the present case; and with these precautions and practices carefully attended to, the produce of the gooseberry will be invariably successful. I may also add, that it is perfectly durable, as much so as Champagne wines of corresponding quality, provided equal care be taken in the bottling, the cellarage, and other management; all of them circumstances in which our domestic fabricators are too apt to fail, thinking that when they have mixed together a portion of sugar and fruit their labour is finished, and that the rest may be trusted to chance. They should consider, on the contrary, that it is but then commenced. From the gooseberry in a ripe state wines may be also made, for which no rules are required. But the produce of the ripe fruit is commonly ill-flavoured, and, whether sweet or dry, is scarcely to be rendered palateable, unless, perhaps, by a most careful exclusion of the husks. (*Cal. Hort. Soc. Mem.* ii. 187.)

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THE

GARDENER'S MONTHLY VOLUME.

THE GRAPE VINE:

ITS CULTURE, USES, AND HISTORY.

BY GEORGE W. JOHNSON,
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THE GRAPE VINE.

ITS HISTORY.

The Grape, a produce of the land first tenanted by the post-diluvian race, delicious as a ripe fruit, a luscious provision when dried, and its juice "making glad the heart of man," naturally rendered the tree which produced it one of the earliest most favoured. Hence, when in this world man was most blessed, the sacred records would convey an idea of that state by describing him as living "under his own vine;" and when sorrows were threatened they are condensed into the prophecy that the offenders should plant vines, but others should gather the produce.

If we refer to the fabulous and to the doubtful periods descanted on by heathen historians, we shall find the same honours paid by them to the vine; and that to the earliest deified sovereigns of each country is attributed the gift to it of this "life-giving tree." Saturn, say these authorities, bestowed it upon Crete; Janus bore it with him to Latium; Osiris similarly benefitted Egypt; and Spain had it through

Geryon, her most ancient monarch. These trad
all point to Greece as the native place of the
and it is there that it is still found wild.

The earliest of all authentic recorded cultivati
that of the vine, for we know that Noah (B.C.
planted a vineyard (*Gen.* ix. 20) ; and how m
was valued is further evinced by even the laws
on Mount Sinai numbering among their prov
many for the protection of the Israelites' vine
These vineyards were not merely confined t
small homesteads attached to each residence, b
tended to large enclosures for the produce of
formed a prominent part of the real property c
land of Israel ; " were let out to husbandmen ;'
were of such extent as, frequently, to return a
annual rental. " Solomon," says *Canticles* vii
" had a vineyard at Baal-hamon ; he let out the
yard unto keepers ; every one for the fruit th
was to bring 1000 pieces of silver." In the
holy volume we have abundant illustrations bor
from the culture of the vineyard, shewing that
culture was judicious and sedulously pursued.

The vineyard was enclosed, and not only rou
boundaries, but its paths were hedged in, to pr
the attacks of cattle, which in the vineyar
France are still so much dreaded and guarded ag
(*Isaiah* v. 2, *Numb*. xxii. 24) ; and human trespa
were strictly warned from the vineyard by the L

cal law (*Exodus* xxii. 5). The soil was carefully dug, stones selected from it (*Isaiah* v. 26), and that was prefered, and certainly is best calculated for the eastern climate, which was rich and by the side of water, for the sake of irrigation (*Ezekiel* xix. 10). The after-culture was carefully attended to, for a weedy vineyard was held up as a demonstration of the slothful husbandman (*Prov.* xxiv. 31), and pruning was strictly practised, but every seventh year the vineyard was directed to be left untouched by the knife (*Levit.* xxv. 4.)

Although the vineyard was the principal source whence the grape was obtained by the Israelites, yet it was also grown upon vines trained over their houses (*Psalm* cxxviii. 3), and various passages in the Scriptures evince that they had a knowledge of the effects of hybridizing (*Deut.* xxii. 9).

The vineyard, as already noticed, was a prominent department of the agriculture of Israel, and every notice of it that we have left demonstrates that its cultivators, as their skill deserved, were placed high in the list of those who were hired servants. In every instance the vine-dresser has precedence of the husbandman (2 *Kings* xxv. 12, &c.); and the head of the department, the keeper of the vineyard, has honourable notice among the superiors of the household (*Cant.* i. 6, 1 *Chron.* xxvii. 27).

This attention of the Easterns to the vine continued down to the commencement of the Christian era, for we have abundant allusions in the New Testament shewing that it was still a principal object of cultivation. When the Romans overthrew Jerusalem, and rendered Palestine a tributary province, they probably found as much to learn in vine culture as they had to teach in most other of the departments of the arts of civilization. Not but that the vine had long before been a highly favoured object of culture with the husbandmen of the Italian soil; for Cato, who flourished 150 years B.C., has left to us abundant information relative to the Roman vine-craft. He gives (*De Re Rustica*, c. 11) a very copious catalogue of all the workmen and apparatus required for the cultivation of a vineyard covering 100 acres. It would be useless to follow these particulars minutely, but it may be observed that the whole was under the supervision of a *villicus*, or bailiff, and that, besides 10 labourers, there were three to look after the cattle, 16 *summa hommines*, or chief cultivators, and a *salictarius*, or tender of the willow ground, the sprays from which were required in training the vines to their supports.

The details of cultivation are far too lengthy to permit our giving in these pages more than a few extracts, and they shall be literal and fair examples of the skill exhibited. "If," says Cato (c. 49), "you wish to remove an old vine, leave only the most robust branch, and prune this so as to leave no more than two buds. Remove the earth from the roots carefully, until you can follow them, and beware that you do not wound them. Place the plant in the furrow or trench as it was before, and cover the roots well. Place it in the same posture, train it similarly, and loosen the earth about it frequently." He correctly states that the best time for grafting the vine is when the blossom is formed, and gives three modes for thus propagating—cleft-grafting, inarching, and by terebration or peg-grafting (c. 41).

Columella, who lived in the time of the Emperor Claudius (A.D. 41-54), wrote three books upon the vine, all of which are extant. Varro, at the beginning of the second century, and Palladius, probably at a somewhat later period, have all left to us very full information as to their contemporary culture of the vine. It would be still more difficult to condense within our limits the information they afford than it would be that given by Cato, but a very just appreciation can be attained of the attention paid to the vine by a mere statement of the fact that more than 60 varieties were then cultivated. One of these, the *Amethystine*, mentioned by Columella and Pliny, is certainly lost to us, for they say the wine from its grapes never occasioned drunkenness.

They were not unmindful of the habits and differing hardiness of the varieties, for Cato says (c. 6), "Plant in the soil best suited to the vine, and lying open to the sun, the Little Aminnæan, the Gemine the Eugenean, and Little Helveolan. Where f are prevalent (in low-lying colder soils) plant Large Aminnæan, or Murgentine, the Apician, the Lucane. Other vines may be planted, with distinction, in any soil."

The knowledge of vine-culture acquired by the mans was not limited to the routine of the vineya for it is certain that they preserved in glass ves grapes upon their vines from autumn to mid-win In Martial's Epigrams (l. viii. Epig. 68) occurs which Fletcher, in 1656, thus faithfully, if not gantly, translates:

> Who that the famed Alcinous' garden sees,
> May well prefer, Entellus, thine to his.
> Lest nipping winter pierce the purple grapes,
> And on the vines smart frosts commit their rapes,
> Thy vintage in a gem enclosed lies,
> And the grape cover'd, not hidden from our eyes.
> So female shapes shine through their tifany,
> And pebbles in the waters numbered be.
> What would not nature free to wit impart,
> Since winter's made an autumn by thy art?

From this passage, Sir J. Banks inferred that Romans cultivated the vine in glazed buildings; that it merely alludes to the practice we have me tioned is confirmed by the more explicit narrative Pliny's Natural History. That natural histori states (l. xiv. c. 1), that in his time the varieties grapes were infinite, differing in size, colour, taste, &c.; some purple, others red, and a third sort green. The white and black were common everywhere. Some were late, others early; and whilst some required to be eaten as soon as ripe, others would keep for a long time in good preservation. Some kinds had their bunches enclosed in glass vessels whilst hanging on the vine, and melted pitch was used to exclude the air from entering round the stalk; and thus old grapes were preserved upon the branches until new grapes came.

Pliny describes the chief varieties cultivated in his time by the Romans. The best in all its qualities was the Aminnean. Many varieties were introduced into Italy from Chios; others from Sicily, Spain, Rhitia, and Savoy.

It is not to be expected that we should be able to identify many, if any, of the grapes known to the Romans with those cultivated by ourselves, since even Pliny says that in his time several of the varieties described by Cato were then unknown.

Pliny enumerates more than one cultivator of the soil who, by the skilful culture of the vine, raised themselves from poverty and even servitude to opulence. One man, Rhemnius Palemon, sold the vintage of a single year for 400,000 *sestercii*, about £3300 sterling. Pliny describes the wines of France, Spain, Greece, and Africa; entering also (l. xvii.)

very fully into the propagation and cultivation of the vine.

The Romans invariably carried with them their improvements in the Arts, and it would have been a solitary exception if the cultivation of the vine in Britain did not date its commencement from their invasion.

Tacitus informs us that then, 55 years before the birth of Christ, the climate was thought not propitious to the vine, and some other trees which were found to vegetate rapidly, but requiring a warmer climate to mature their produce, failed to do so in the moist climate of our island. (*Vita Agricolæ,* cap. xiv.) However, as the Roman settlers became better acquainted with the widely different districts of the Island, and, probably, as they advanced further into the south, they found that some parts were not unfit for vineyards. They consequently applied for the imperial permission to plant them, and though the application was refused by the narrow-minded policy of Domitian, it was granted A.D. 278 by his more sagacious successor the Emperor Probus. *(Vopiscus).*

That year, then, was the birth-time of British vine culture, and despite the succeeding wars and intestine convulsions attendant upon the invasions of the Northmen, and the consequent changes of dynasties, that culture was clung to and progressed. The blood of the grape was too justly estimated by the jolly monks of those days to permit the craft requisite for its culture to be numbered among the lost arts, and their care met a willing aid from a population still more deeply imbued with carousing propensities.

Guin-wydden, Guin-bren, Guin-ien, or Fion-ras, the name of the vine in the Welch, Cornish, Armorican and Irish dialects, is, literally, the Wine-tree; and plantations of it were flourishing here at the commencement of the eighth century, as is testified by Bede. (*Eccles. Hist.* b. 1, c. 1.)

The Normans did not decline from this attention paid to the vine by their Saxon predecessors. At Edmonsbury, in Suffolk, the monks of its Monastery planted a vineyard in 1140, and William of Malmesbury, their contemporary, says that vineyards were possessed by barons as well as monks, and that the grapes of the Isle of Ely furnished wine next best in quality to that from the grapes of the vale of Gloucester. Among other places it is evident that Winchester was at a very early period celebrated for its vineyards, for among our most ancient literature are verses allusive to them, and this line,

"Testis est London ratibus, Wintonia Baccho,"

is quoted by Twynne (*De Rebus Albionicis,* 116) in proof that Winton, afterwards named by the Saxons Winchester—that is, the City of Wine—was so called because there was the best vintage in Britain.

Another old monkish verse is,

"Quatuor sunt Eliæ; Lanterna, Capella, Mariæ;
Et Molendinum, nec non dans Vinea vinum."

It is translated thus by Ralph Austen:

"Four things of Ely town much spoken are,
The leaden Lanthorn, Mary's Chapel rare,
The mighty Millhill in the minster field,
And fruitful Vineyards which sweet wine do yield."

Of Canterbury and that neighbourhood, the same author makes the abbot of St. Augustine's say, that their house was formerly not destitute of vines: and Somner informs us, that in the year 1285, both that abbey and the priory of Canterbury were plentifully furnished with vineyards.

At Rochester, a large piece of ground adjoining to the city is now called the Vine; another is so called at Sevenoaks, in Kent: this also is the name of the seat formerly of the Barons Sandes, in Hampshire, and now of Mrs. Chute.

At Halling, near Rochester, the bishop of that see had formerly a vineyard; for when Edward 2nd, in the nineteenth year of his reign, was at Bockingfield, Bishop Hamson sent him thither, as Lambarde tells us, "a present of his drinkes," "and withal both wine and grapes of his own growth in the vineyarde at Halling." Captain Nicholas Toke, of Godington, in Great Chart, in Kent, "hath so industriously and elegantly," says Philipot, "cultivated and improved

English vines, that the wine, pressed and exacted out of their grapes, seems not only to parallel, but almost to out-rival that of France."

Of Sussex, Lambarde writes, "History doth mention, that there was about that time (the Norman invasion) great store of vines at Santlac (near to Battel.)" He adds, as to Berkshire, "the like whereof I have red to have been at Windsor, in so much as tithe of them hath been there yielded in great plenty, which giveth me to think, that wine hath been made long since within the realm; although in our memory it be accounted a great dainty to hear of." He further observes, that some part of the wine was spent in the king's household, and some sold for the king's profit.

Domesday Book mentions at Ragenei, in Essex, one park and six arpennies of vineyard, which, if it takes well, yields twenty modi of wine. And at Ware, a park and six arpennies of vineyard very lately planted.

We hear of vineyards also in Middlesex, Cambridgeshire, at Denny Abbey, the Isle of Ely, at Dunstable, and at St. Edmunsbury, in the engraved plan of which town the vineyard of the abbey is particularly noted.

Within the walls of the city of London there is a street called the Vineyard; and others in the liberties and suburbs, and in Westminster; there is Vine-street in

Hatton-garden, and St. Giles's and Piccadilly; and the vineyards of Houndsditch and Coldbath-fields.

In the archives of the church of Ely is the following register:

Exitus Vineti	2	15	3¼
Ditto Vineæ	10	12	2½
10 bushels of Grapes from the Vineyard	0	7	6
7 Dolia Musti from the Vineyard, 12 Edward 2nd	15	1	0
Wine sold for	1	12	0
Verjuice	1	7	0
For Wine out of this Vineyard	1	2	2
For Verjuice from thence	0	16	0

No wine, but verjuice, made 9 Edw. 4th. Hence it appears plainly that at Ely grapes would sometimes ripen, and the convent made wine of them; and when they did not they converted their produce into verjuice.

In Northamptonshire, Martin, Abbot of Peterborough, in the time of King Stephen, is said expressly, in the Saxon Chronicle, to have planted a vineyard, and it was a large one. Madox, in his History of the Exchequer, writes, that the sheriffs of Northamptonshire and Leicestershire were allowed in their account, for the livery of the King's vine-dresser, at Rockingham, and for necessaries for the vineyard.

There are evidences of vineyards still farther north, as at Darley Abbey, in the county of Derby.

In the reign of Henry 3rd, the neglect of vineyards in England is attributed by Twyne in part to that fondness for French wine which then came upon us. In this King's time, about the year 1260, a dolium (36 gallons) of the best wine could be bought for forty shillings, sometimes for two marks, and sometimes for twenty shillings.

In more modern times, the vine, says Dr. Plot, has been improved by Sir Henry Lyttleton to that advantage at Over Arley, that he has made wine so good there as not to be distinguished from the best French wines. And Dr. Ralph Bathurst, president of Trinity College, and Dean of Wells, made as excellent claret at Oxford in 1685.

Barnabe Googe, in his Epistle to the Reader, prefixed to his translation of Heresbachius's Husbandry, 1586, says, "he is fully persuaded we might have a reasonable good wine growing in many places of this realm: as undoubtedly we had immediately after the Conquest, till partly by slothfulness, not liking any thing long that is painful, partly by civil discord long continuing, it was left, and so with time lost, as appeareth by a number of places in this realm, that keep still the name of vineyards; and upon many cliffs and hills are yet to be seen the roots and old remains of vines. There is, besides Nottingham, an ancient house called Chilwell, in which remaineth yet as an ancient monument in a great window of glass, the whole order of planting, proyning, stamping and

pressing of vines. Beside, there is yet also growi
old vine that yields a grape sufficient to make a
good wine, as was lately proved by a gentlewom
the said house. There hath, moreover, good ex
ence of late years been made by two noble an
hourable Barons of this realm, the Lord Cobhan
the Lord Williams of Tame, who both had gr
about their houses as good vines as are in many
of France."

Samuel Hartlib, in 1659, says, that here in
land some ingenious gentlemen usually make
very good and long lasting. He instances Sir
Ricard, at Great Chart, in the Weald of K
place very moist and cold, who yearly made
eight hogsheads of wine, which was very much
mended by divers who had tasted it.

We are informed, in Rea's Flora (1702), th
Thomas Hanmer asserted, he had drunk in s
places good wine of English growth.

At Arundel Castle, in Sussex, a seat of the
of Norfolk's, a noble vineyard was planted, an
nually yielded considerable quantities of wine;
in 1763, in his Grace's cellar at Arundel, there
about sixty pipes of excellent Burgundy. This
says Martyn, is not, it is true, of quite so fine a fl
as the wines of Beaune; yet does it much exceed
tities of Burgundy wine annually imported into Eng
and most of what is consumed commonly in Fr

Mr. Bradley says, he cannot help mentionin how our poor soils might be improved by making of vineyards; a good instance of which is at Mr. John Warner's, a gentleman of Rotherhithe, who makes good wine from his own vineyards.

Stephen Switzer, in his "Ichnographia Rustica," published in 1742, affirms that vineyards may be so cultivated in England as to produce large quantities of grapes, and those so well ripened as to afford a good and substantial vinous juice; that there were then in several parts of Somersetshire flourishing vineyards; and that the vineyard of the late Sir William Basset annually produced some hogsheads of good-bodied and palatable wine.

Bartholomew Rocque, of Walham Green, made wine for thirty years from a vineyard he had planted in a common field garden; and although the ground was flat, the wine was as good as that of Orleans or Auxerre.

I have known, says Mr. Hanbury, good wine made of grapes growing in England, and have drank our Burgundy no way inferior, that my taste could find out, to the noted wine which we have constantly imported from that country.

Mr. Vispre, in a dissertation on the growth of wine in England, printed at Bath in 1786, informs us, that he planted a piece of ground with vines at Wimbledon in March 1783; that his intention was to train the shoots, as he did afterwards at Chelsea, upon the ground in their natural positions, like the vines of melons and cucumbers; and that he hoped thus to make good wine with well-ripened grapes, almost every year. In 1784 he presented his plan to the Society for the Encouragement of Arts, &c. The second season proving more favourable than the first, the grapes on the vines trained near the ground were considerably larger than those of the same kind growing on a south wall.

Hales, in his "Practical Husbandry," says that he drank, with Dr. Shaw, wines made under his own care, from a little vineyard behind his garden at Kensington, which equalled many of the lighter wines of France; and while due care was taken of the vineyard at Hammersmith, much very good wine was obtained there for sale: yet neither of these were favourable spots. Mr. King's vineyard, at Brompton, was well known to the curious; as was also that of the Hon. Charles Hamilton, at Pain's Hill, near Cobham, in Surrey. This last was situated on the south side of a gentle hill; the soil a gravelly sand; it was planted entirely with two sorts of Burgundy grapes, the Tuvernat, which is the most delicate, but the tenderest, and the Miller Grape, commonly called the Black Cluster, which is more hardy. The wine which he made resembled Champagne. *(Miller's Garden. Dict. by Martyn).*

About the middle of the last century there was a vineyard at Beaulieu, in Hants, on the borders of the New Forest, where wine was made, and also brandy; and at a still later period there was a vineyard at Tunbridge, near the old Castle. What the quality of the wines may have been at either of these vineyards is not probably now remembered; but the writer of this article was told, many years ago, by an old gentleman who had tasted the Beaulieu brandy, that, considering its age, it was not bad. *(Gard. Chron.* 1841, 662.)*

Such have been the efforts made in previous centuries to establish vineyard culture in this country; and we shall consider the practical part of that culture in a future section.

Forcing the vine is another department of its cultivation, introduced at a later period, but now far more successfully pursued. Even as late as 1629, it is evident from the "Paradisus" of Parkinson, published in that year, that the vine was scarcely attended to even when grown against a wall, and so far were gardeners then from obtaining grapes in winter, that he does not even mention such a possibility, but has a chapter devoted to the mode of perserving them through that season in sand.

The time for the culture of grapes in the vinery

* A close near Beaulieu Church is still known by the name of "The Vineyard."

was dawning, however, for mention is made of glasses for the protection of plants and of trees being grown in boxes, placed under temporary structures, and of "some comfort being given them in the colder times by a stove." Nevertheless, nearly a century elapsed before anything like a hothouse for the culture of the vine was erected, and the honour of being the birthplace of such a structure belongs to Belvoir Castle, the seat of the Duke of Rutland. The description of this structure occurs in Switzer's "Practical Fruit Gardener," published in 1724, which work has a chapter devoted to the "Forcing of Grapes, &c." The erection of this vinery was rather the result of accident than of design. About 1715 hollow sloped walls were built at Belvoir according to the design of Mr. N. Facio Duilhier, then tutor to the Marquis of Tavistock, and the ripening of the grapes upon them was endeavoured to be hastened by having fires burning behind them from Lady Day to Michaelmas. (*Lawrence's Fruit Gardener's Kalendar*, 1718, p. 22.) The walls, failing to produce the early ripening effects desired, were next covered with glass, and thus led to the erection of the first regularly glazed forcing structure for vines in this country of which we have any account. (*Switzer's Fruit Garden*, p. 318.) It seems extraordinary that the employment of such a structure for this purpose was not before suggested, for we know that the forcing of cucumbers had been before practised, and greenhouses and hot-houses for preserving exotic shrubs through our winters had been in use half a century. Evelyn mentions Loader's Orangery in 1662, and those of the Duke of Lauderdale and Sir Henry Capel. The last mentioned gentleman also had a Myrtilleum. The greenhouse and hothouse in the Chelsea Garden are noticed by the same author, as well as by Ray in 1685. "What was very ingenious," says Evelyn, "was the subterraneous heat conveyed by means of a stove under the conservatory, all vaulted with brick, so that Watts, the gardener, has the doors and windows open in the hardest frosts, excluding only the snow."

The advantage to be derived from the cultivation of the vine under glass being thus stumbled upon, glazed structures, nearer resembling our present vineries, were soon adopted, and are to be found depicted in contemporary publications. Correct knowledge of the requisite treatment was soon accumulated also, and this was first laid before the public in the two works now to be noticed.

Mr. J. Kyle, gardener to the Hon. Baron Steuart, of Moredun, N.B., published in 1787 a very excellent treatise on the forcing of peaches, nectarines and vines, and this is one of the first works on the subject that the gardener may even now read with advantage. He was preceded, however, ten years by Mr.

W. Wilson, gardener to Sir J. Cockburn, Bart., of Persham, whose "Treatise on Forcing Early Fruits" appeared in 1777. For the most part it is very correct in its directions, though the author did not attempt to obtain ripe grapes before the end of June. It is the earliest distinct work on the subject that issued from the press, and has the additional merit of giving directions as to temperature regulated by Fahrenheit's thermometer.

The varieties of the grape known in this country even three centuries since were very numerous, for Lyte, writing in 1578 (*Herball*, 650), says it was not easy to enumerate all the kinds of red, blue, and white grapes which were then cultivated; and Gerard, in 1597 (*Herball*, 724), also says that it would be impossible to describe all the varieties.

Lawson, in his "New Orchard," also published in 1597, gives no direction for cultivating the vine, contenting himself with this single sentence, "A vine overshadowing a seat is very comely, though her grapes with us ripen slowly."

Parkinson, in his "Paradisus," 1629, says that "his very good friend John Tradescant hath 20 sorts of grapes growing, and knew not how or by what names to call them," and then enumerates twenty-three varieties, embracing some of the Muscadines, Frontignans, and others still cultivated by us. He notices, however, that the vine was neglected in this country, and even its wall culture scarcely attend to. But this undeserved neglect soon ceased, and in a few years subsequently we find every horticultural writer urging attention to its cultivation.

Austen, in his "Treatise on Fruit Trees," published in 1653, says that Red and White Muscadine vines "bear a store of good fruits upon a south wall, if well ordered."

John Rose, gardener to Charles the 2nd, published his "English Vineyard Vindicated" in 1675. It is dedicated to the "merry monarch;" and in the dedication, Rose says, "I know your Majesty can have no great opinion of our English wines, as hitherto they have been ordered, but it is not altogether from defect of the climate, at least not in all places; and that if my directions be followed, that precious liquor may once again recover its just estimation, though the product of your Majesty's dominions."

The directions are most judicious, both for selecting the soil, pruning, &c., and is the first work on vine-culture, evidently written from actual experience, that we have met with from the pen of an English gardener.

Langford, in the second edition of his "Instructions to raise Fruit Trees," published in 1696, gives very good but short directions for the culture of the vine against south walls. Of vineyards he says there were then few, though in a very favourable year he had seen grapes ripen in one near Bristol.

Switzer, in his "Practical Fruit Gardener," published in 1724, incorporates the chief part of Rose's work, already noticed, but adds much valuable information from his own practice and knowledge. He says that it is to Lord Capel and Sir William Temple we are indebted for the introduction, from the continent, of some of our best varieties of the grape, Sir William having brought into England the Chasselas, Parsley-leaved, Frontignac, Amboyse, Burgundy, Black Muscat, and Grizly Frontignac.

The building of sloping walls about this time, as already noticed, Switzer says, led the world to the improvement of "glassing and forcing grapes." The Duke of Rutland had the walls heated by flues and "glassed them all before as you do stoves, which penned in the heat to a great degree, and from this they had good success." Switzer suggested that the roots also should be kept warmer, and this was immediatley effected by a flue passed under the border. The success was then more complete.

Batty Langley, in his "Pomona," published in 1729, gives drawings of nineteen varieties of the grape, and among his descriptions there is, for the first time, the Black St. Peters. He merely says, "it is a fine black grape covered with a violet flew; its pulp a little tinged with red, very firm, with a most delicious rich juice. It is a great bearer, and ripens by Oct. 10 on a west wall."

It is needless to trace in detail the progress of vine-culture further, for we have now brought its history down to the time of Miller and others, who still rank among modern horticultural authorities. The first edition of Miller's Dictionary appeared in 1731, and contains moderately full directions for the cultivation of the vine. In the following year Sir Alexander Murray published "The Nature and Method of Planting, &c. a Vineyard," a work containing much useful information. Hitt's standard work on "Fruit Trees" appeared in 1755; Abercrombie's "Hot-house Gardener," and other works, between 1774 and 1790, and these, with some others of minor note, gave way to Speechley's "Treatise on the Vine," which issued from the press in the year last named. This is still a work of good authority, and no separate volume upon the subject worthy of consideration has subsequently appeared in this country, excepting Busby's publications reprinted in 1834 from others he published in Australia; Roberts's "Culture of the Vine under Glass" in 1842, and Hoare's equally valuable treatise on the culture of "The Grape Vine on Open Walls," which had appeared about three years previously.

We do not intend to assert that there had been no other contributions to our store of knowledge concerning the management of the grape vine, for, on the contrary, no other subject has more employed the pens of our gardeners during the present century.

Their contributions, however, are spread through the transactions of Societies and the periodical literature of the time. It has been our object in the following pages to concentrate these, arranging them and comparing them with our own experience.

Of the progress of vine culture in other countries we have not space permitting even a cursory glance, therefore we must content ourselves with little more than a notice of the localities where the most celebrated vineyards are situated, and of the wines they yield.

In France, the best Burgundy wines are produced in the department of Cote d'Or, and are known as Roman-Conti, Chambertin, Richebourg, Vougeot, Saint Vivant, la Tache, Saint Georges, and Corton. The vineyards producing these are all within two or three leagues of Dijon. The grapes producing them are Miller's Bùrgundy (Noirin), and Black Cluster (Pineau), which last is grown alone in the best vineyards. The same department produces also some of the most perfect of white wines, and known as "les vins de Mont Rachet."

The Bordeaux wines, or clarets, are the produce of the Gironde department. Of these wines those of the Lafitte, Chateau-Margaux, and Haut-Brion vineyards are the best. The vines grown in these are known there as Le Carmenet, La Carmanere, Le Malbek, and Le Verdot, of which we do not know the English synonymes.

The white wines of Barsac and Sauterne, in the same locality, are the produce of mixed berries from the Savignieu blanc, St. Emilion blanc, Auba, and some others equally uncultivated in England, because not suited for the table.

The department of Marne is the birth-place of the Sillery, d'Ay, Mareuil, Hautvillier, Pierry, and Dissy Champaigns. They are produced from the fruit of the Epinette grape.

In Spain, though above 500 varieties of the grape are known, the one which is cultivated most, and enters more or less into all the best wines, is called there Ximenes. Near Alicant is produced the celebrated Tinto. Seven leagues from Cadiz is the town of Xeres de la Frontera, the birth-place of genuine Sherry.

The standard wine of Portugal, Port, is made from the grapes of a vine with black berries, and very rough, deeply lobed leaves. The best, or Factory, wine comes from the banks of the Douro, and the best of the best from the vineyards of Pezo da Regna. Lisbon wine is from vineyards near Carcavellos, and Bucellas from others within six leagues of Lisbon.

In Sardinia, the vintages are so abundant that the grapes are often left upon the vines for want of vessels to contain their juice. The most celebrated wine of this island is Malmsey, produced in the vineyards about Sorso, Bosa, and Alghier. In Brescia is pro-

duced the celebrated Vino Santo; and the La
Christi is from the vineyards of Albano and
Vesuvius. Every other district of Italy, Sicily
sica, &c. produces good *vin ordinaire*, but the
none of particular celebrity.

In Germany and in the district of Treves is
duced the best Moselle. It is from the grap
the white Rissling, known there as the Klingelb
The Rhine wine, Hock, brought to England, is
from the vineyards of Mont Tonnerre. The b
from the vineyards of Deidesheim, Rudesheim
hannisberg, Fenerbach, and Laufen. Vin du
Esprit is from Stein, in Wurtzburg.

Russia is associated in most minds with tho
of snow and extreme cold, but, in fact, its vast
tories embrace latitudes as favourable, or more f
able, for the growth of the vine than any otl
Europe. The wines of the Caucasus and Ge
and others from the banks of the Don, are exc
In the Crimea the vine was cultivated even i
time of Strabo, and, though since neglected, its
yards are again so rising into celebrity that
thought that Russia may, at no distant period
duce wine enough in the Crimea for her own
sumption. Vineyards were especially planted
in the year 1804, at the suggestion of the celel
naturalist, Pallas. The situation is named Gad
in the territory of Kosi. Cuttings of vines

brought from France, Zante, Tenedos, the Rhine, Astracan, and Kizliar; and two Frenchmen, the one a vine-dresser, and the other a farmer, were appointed to plant and to manage them. Ten orphan pupils, from the military school of Cherson, were put under the care of these cultivators. Government supplied the necessary capital for every part of the undertaking; and 28,000 vines were planted, which, in the year 1826, produced 1500 vedros of wine resembling those of Hungary, Bourdeaux, the Rhine, Asmalhausen, Muscat, Petit-Bourgoyne, Zante, and Kakour, of the best quality. (*Bul. Univ.* Oct. 1827.)

In Bohemia, Styria, Istria, Moldavia, and other parts of Austrian Europe, good ordinary wines are produced: but that from Mount Tokay, in Hungary, is alone of particular celebrity.

All the Greek islands, but especially Candia, produce good wines.

Persia has districts covered with vineyards; but its best wine, Shiraz, comes from a town of the same name, and is pressed from the grapes of a vine called the Damas.

From Africa we obtain but little good wine, and that little is Constantia, from a small vineyard of the same name at the Cape of Good Hope.

From the Canary Islands come Malmsey, Vidonia, and Teneriffe, from the isle bearing the latter name; Canary and Madeira from the islands so called. The best Madeira is made from the produce of a variety of the vine called there the Vidogne.

We know of no good wines from American vineyards.

Hindostan is for the most part too hot for the vine. On the coast of Coromandel it is trained on different kinds of trellises, and as arbours, but without success. Much art is not employed in training. But the fact that the solar heat is too intense in those regions for the constitution of the vine is evident, as no fruit is ever obtained unless under some mitigating circumstances, as great elevation above the level of the sea, shady situation, or peculiar aspect. Grapes come to great perfection on the mountainous parts of the ceded districts of the Mysore, in Lahore and Cashmere. It is not improbable, if vines were trained on the north-western and other aspects shaded from the meridian sun, that they would ripen their fruit even in the hotter latitudes of India. We have eaten very good grapes thus cultivated at Calcutta. The produce, however, was scanty.

BOTANICAL CHARACTERS.

THE common grape vine (*Vitis vinifera*) is a hardy deciduous climber, belonging to Pentandria Monogynia class and order of the Linnean System; and the Natural Order Vitaceæ. It is naturalized in most parts of the globe's more temperate latitudes. Mr. Hawkins, and other good authorities, conclude that it is a native of Greece; and it is, certainly, there found wild on the banks of rivers, flowering during May and June. From the vine in its wild state are derived the following specific characters, from which its numerous varieties have more or less departed. *Stem,* woody, tough, sending out long, trailing, subdivided furrowed, leafy *branches,* which climb by means of tendrils to a great extent, and when young are clothed with loose shaggy down. *Leaves,* alternate on longish stalks, simple, roundish heart-shaped, notched, coarsely serrated, veiny, divided about half-way into five more or less distinct lobes; when young they are downy, like the branches, especially beneath; but otherwise naked and smooth; deciduous. *Tendrils* opposite to each foot stalk, solitary, spiral, divided, about the length of the leaves. *Clusters,* here and there in the place of a tendril, drooping, panicled, much branched, the ultimate stalks somewhat umbellate, or corymbose. *Flowers* very numerous, small, green, fragrant like mignonette. *Petals* forced from their base by the stamens, which elevate them in the form of an umbrella, downy at the top. *Berry* small, black.

In very cold regions it refuses to grow; and within 25 degs. or even 30 degs. of the equator it seldom

produces good fruit. In the northern hemisp
the proper wine country is from 25 degs. to 51
of latitude.

The anatomy of the vine has been very accu
examined by Mr. W. W. Capper, of Bath, an
results of his examinations published in the
volume of the *Gardener's Magazine*, but as they
elecited nothing of useful novelty, nor anythin
viously unknown to the general vegetable physiol
we shall content ourselves with this reference,
assuring the student of that branch of science th
will do well to refer to Mr. Capper's papers and
numerous illustrations.

For the following observations, most usef
guides to the gardener, we are indebted to th
Mr. Knight :—

The vine alone amongst fruit-trees appears ca
of being bound and trained to a great distance
a wall without sustaining any injury, its sap conti
to flow freely and abundantly to its very d
branches. Owing to a peculiarity of structur
habit which is confined to those species of trees
which nature has withheld the power of supp
their own branches, the alburnum of all plants o
habit is excessively light and porous ; and not
intended by nature to support its own weight, o
of any part of the foliage of the tree, does not a
with age any increased solidity, like that of tr

a different habit; and on this account probably it never, how long soever deprived of exercise, loses in any degree its power of transmitting the ascending sap. *(Knight's Papers, 338)*.

Every bunch of grapes commences its formation as a tendril, and it is always within the power of every cultivator to occasion it to remain a tendril. The blossoms are all additions, the formation of which is always dependent upon other agents; and if any considerable part of the leaves be taken off the branch prematurely, or if the vine be not subjected to the influence of the requisite degree of heat and light, the tendrils will permanently retain their primary form and office; and it is very frequently observable, when much of the foliage of fruit-trees has been destroyed by insects, or when the previous season has been cold and wet, that blossoms are not formed at all, or are feeble and imperfect, and consequently abortive. *(Ibid. 227.)*

The tendril of the vine is internally similar to that of the ampelopsis, though its external form, and mode of attaching itself by twining round any slender body, are very different. Some young plants of this species, which had been raised in pots in the preceding year, and had been headed down to a single bud, were placed in a forcing-house, and the shoots trained perpendicularly upwards. Their tendrils, like those of the ampelopsis, when first emitted, pointed upwards; but they gradually formed an increasing angle with the stems, and ultimately pointed perpendicularly downwards; no object having presented itself to which they could attach themselves. Other plants of the vine, under similar circumstances, were trained horizontally; when their tendrils gradually descended beneath their stems, with which they ultimately stood very nearly at right angles. A third set of plants were trained almost perpendicularly downwards, but with an inclination of a few degrees towards the north; and the trendrils of these permanently retained very nearly their first position, relatively to their stems; whence it appears that these organs, like the tendrils of the ampelopsis, and the claws of the ivy, are to a great extent under the control of light.

A few other plants of the same species were trained in each of the preceding methods, but proper objects were placed, in different situations near them, with which their tendrils might come into contact. The tendrils of the vine varied their positions in every period of the day, and after returned again during the night to the situations they had occupied in the preceding morning; and they did not so immediately, or so regularly, bend towards the shade of contiguous objects. But as the tendrils of this plant, like those of the ampelopsis, spring alternately from each side of the stem, and as one point only in three is without a tendril, and as each tendril separates into two divisions, they do not often fail to come into contact with an object within their reach, and the effects of contact upon the tendril are almost immediately visible. It is made to bend towards the body it touches, and if that body be slender, to attach itself firmly to it.

The tendril of the vine, in its internal organization, is apparently similar to the young succulent shoot and leaf-stalk of the same plant, and it is as abundantly provided with vessels, or passages, for the sap; and it is alike capable of feeding a succulent shoot, or a leaf, when grafted upon it. It appears, therefore, not improbable, that a considerable quantity of the moving fluid of the plant passes through its tendrils; and that there is a close connection between its vascular structure and its motions. *(Knight's Papers,* 166.)

All cultivated plants retain habits long after their removal to situations in which those habits are unsuitable. Thus the Hyacinth shews symptoms of vegetation in England during our autumn, which answers to the spring of its native country, the south of Asia. The vine is not an exception to this rule, as appears from the following experiments.

Mr. Knight placed some vines, which grew in pots, in a forcing-house, at the end of January, where they produced ripe fruit about the middle of July; and soon after that period, the pots were taken from the house and put under the shade of a north wall, in the open air. Water was subsequently given in small quantities only; and the leaves of the plants soon fell off. In August the plants were pruned; and in September they were removed to a south wall, where they soon vegetated with much vigour, and continued to grow till their young shoots were killed by frost. Other vines, of the same varieties, were suffered to remain in the forcing-house till late in August; where they were subjected to the mode of management above described, except that they were not removed from their situation under a north wall, nor pruned, before the approach of winter. These were then placed against a north wall, where their fruit ripened well in the following season, in a climate not nearly warm enough to have ripened it at all, if the plants had previously grown in the open air. (*Knight's Papers*, 229).

Mr. Knight further observes that if two plants of the vine, or even if obtained from cuttings of the same tree, were placed to vegetate, during several successive seasons, in very different climates—if the one were planted on the banks of the Rhine, and the other on those of the Nile—each would adapt its habits to the climate in which it were placed; and if both were subsequently brought, in early spring, into a climate similar to that of Italy, the plant which had adapted its habits to a cold climate would instantly vegetate, whilst the other would remain perfectly torpid. Precisely the same thing occurs in the hothouses of this country, where a plant accustomed to the temperature of the open air will vegetate strongly in December, whilst another plant of the same species, and sprung from a cutting of the same original stock, but habituated to the temperature of a stove, remains apparently lifeless. It appears, therefore, that the powers of vegetable life, in plants habituated to cold climates, are more easily brought into action than in those of hot climates; or, in other words, that the plants of cold climates are most excitable: and as every quality in plants becomes hereditary, when the causes which first gave existence to those qualities continue to operate, it follows that their seedling offspring have a constant tendency to adapt their habits to any climate in which art or accident places them. (*Knight's Papers*, 173.)

The experiments of Mr. Hales upon the force with which the vine propels its sap, the amount of its transpiration, &c. are important to be understood by the gardener. He found that a vine having a surface of leaves equal to 1820 square inches perspired in 12 hours of daylight from 5 to 6 ozs., and that the velocity of the sap's ascent was about 152 inches in those hours. The force with which the vine propels its sap is shewn by the fact that from the stem of a vine $\frac{7}{8}$ of an inch in diameter, on more than one occasion, its sap issued with a force that raised a column of mercury $32\frac{1}{2}$ inches, consequently shewing that it was equal to sustain the weight of a column of water nearly $36\frac{1}{2}$ feet in height.

Mr. Hales also tried experiments to find at what rate the epidermis of the vine allowed moisture to transpire through it, but the only experiment worthy of notice is that in which he found that in January vine cuttings lost 1-24th part of their weight in eight days. He also endeavoured to impart flavour to grapes by forcing into the sap-vessels of the vine orange flower water, but in this he was unsuccessful. He found this flavour was thus imparted strongly to the wood, and reached even to the leaf-stalks, but here it was elaborated and decomposed, for no such flavour reached to the fruit. (*Hales' Veget. Statics.* i.)

CHEMICAL COMPOSITION.

The composition of the fruit of the vine, owing to its importance in the arts, very early engaged the attention of chemists, though the results of their researches are not of much importance in an economical point of view.

The *sap* of this tree is generated in quantity, and is propelled with a force superior to that of any other in our climate, but we only recur to that fact to observe that both the quantity and quality differ greatly in the verieties cultivated, and that an attention to this is very desirable in selecting the stock for a scion accordingly as its vigour is required to be aided or checked.

The specific gravity of the sap of a black cluster vine stock on which a black Hamburgh had been grafted was, when obtained six inches from the ground, 1,003; and at five feet from the ground 1,006; but the same black Hamburgh, growing upon its own roots, had specific gravities at corresponding heights of 1,004 and 1,009. This increase is of great importance to a tree's growth, when the quantity of sap passing annually through its vessels is considered. The exact amount of this, it is perhaps impossible to discover, but its extent may be appreciated by the quantity of moisture their roots are known to imbibe, and by the fact that a small vine branch has poured out sixteen ounces of sap in twenty-four hours. (*Johnson's Princ. of Gardening*, 156.)

The sap of all trees is nearly similar, disagreeing not so much even as the blood of animals. It is the peculiar juices elaborated from the sap which make them so to differ in quality. The sap of the vine has been examined by Dr. Prout. It has a whitish appearance like common river water. Its taste sweetish but rough. Only one part of residuum was left when 2,300 parts of the sap were evaporated to dryness. Half of that one part was carbonate of lime (chalk), and the remainder chiefly vegetable matters insoluble in alcohol (spirits of wine). The sap contained carbonic and acetic acids and an alkali. (*Ann. of Philos.* v. 109.)

M. Robiquet has also examined the sap of several species of vine more minutely than Dr. Prout, and found in them carbonic acid, tartrate of lime, bi-tartrate of potash, and some vegeto-animal matter. (*Journ. de Pharm.* xviii. 36.)

Grapes. After the sap has been elaborated in the leaves, it passes from these in part to the fruit, and here is completed that magic process by which the almost tasteless sap is gradually changed into one of the most luscious of juices. The final change seems to commence in the very stalks of the bunches, for these, in common with the tendrils, which we have seen are but abortive bunches, contain an abundance of citric acid.

Verjuice, or the liquid obtained from unripe grapes, contains tartar, sulphate of potash, sulphate of lime, much citric acid, a little malic acid, extractive, and water, but neither gum nor sugar. As the grapes advance to maturity, the citric acid gradually disappears, and gum and sugar appear in its place. The juice of ripe grapes contains also gluten and fibrous matter, merely in a state of mixture, and therefore separable by the filter, or still better by boiling and skimming the liquid. The substances held in solution are chiefly sugar, syrup, gluten, gum, and extractive. When this juice is evaporated to dryness, it yields from a third to a fifth of solid matter, according to the species of grape employed, and the season of the year. To extract the sugar from this juice, Prout saturated the acids which it contains with potash, boiled it down to a half, and left it at rest. By this means several of the salts subsided. Its specific gravity was 1·215. It was then mixed with blood, heated, skimmed, filtered, and boiled down to a syrup. It gradually becomes crystallized, and resembles the raw sugar from the West Indies. In this state its specific gravity is about 1·500. This raw sugar, according to Prout, is composed of

Crystallizable sugar	75·00
Syrup, or uncrystallizable sugar	24·44
Gum	0·31
Malate of lime	0·25
	100·00

besides some extractive, the quantity of which cannot be well ascertained. The syrup holds in solution a considerable quantity, propably more than half its weight, of crystallizable sugar; but it is difficult to separate it. The raw sugar thus obtained is not so sweet as that from the sugar cane, since four parts of the latter will go as far as five parts of the former.

But it may be applied to all the purposes of common raw sugar. This raw sugar may be refined precisely in the same way as that of the sugar-cane. It is then white, but inferior in consistence to common sugar. It is not so sweet, and has a striking resemblance to the sugar of honey. It does not crystallize, but assumes the form of sphericles. It is not so soluble as the sugar of canes, and is therefore more easily separated from the other substances in the juice of grapes. Prout informs us that the raw sugar from grapes, when diluted sufficiently with water, ferments, and is converted into wine. *(Thomson's Organ. Chem.* 636.)

Other chemists have more particularly sought for the acids and salts in the juice of ripe grapes. Among these are Scheele, Braconnot, and Berard: the two first named thought the only acid it contained was the tartaric, but Berard found an odoriferous substance, sugar, gum, albumen, malic acid, malate of lime, tartaric acid, and tartrate of lime. (*Ibid.* 893.)

VARIETIES.

It may be taken as an established axiom, that good vine-culture (not good varieties) is now required; for that we have abundance of the latter will be apparent from the list we are about to place before the reader, taken chiefly from the catalogue of the London Horticultural Society. We would also warn the reader frem being seduced into the purchase of professed novelties, but which, too often, are new only in name. The most experienced grape-growers have been deceived into paying high prices for plants which eventually proved to be only old varieties altered and improved by the circumstances of good cultivation and a very favourable soil. Mr. Speechley published a list of 112 varieties, but it is well known that he believed that there were not more than half that number really differing. Difference of culture, soil, and aspect, make such extreme changes in the appearance and quality of all fruits, and especially of the grape, that no certain judgment can be formed of their distinctness until they have been subjected to one test in common. This fact renders the Chiswick Gardens so valuable as an authority.

SELECTIONS.

For Cottage Walls.—Common Muscadine, Black July, Large Black Muscadine, and White Sweetwater.

For a Vineyard in the South of England.—Black Burgundy and Miller's Burgundy. The White Riessling would also succeed, probably: it is the best vineyard grape of Germany.

For Open Walls.—Royal Muscadine, Grov
Sweetwater, Black Prince, and Black Cluster.

For a Greenhouse.—The Black Hamburgh,
Prince, Royal Muscadine, Sweetwater, and
Muscadine.

For Succession in Three Vineries.—1st.
Hamburgh, Royal Muscadine, and Black P
2nd. Black Hamburgh, White Frontignan, Cha
Musqué, and Black Frontignan. 3rd. Charles
Tokay and Oldacre's St. Peter's.

For Pot Culture.—The best is the Black Co
and then the Black Hamburgh; Royal Musc
Black Muscadine, Red Frontignan, White Sweet
White Frontignan, and Pitmaston White Cluste

These selections differ somewhat from tho
commended by Mr. Hoare and Mr. Tillery,
are as follow:

Open-wall Culture.—Varieties best suited fo
according to the experience of Mr. Hoare, are
Hamburgh, Black Prince, Esperione, Black M
dine, Miller's Burgundy, Claret Grape, Black
tignan, Grizzly Frontignan, White Frontignan,
Muscadine, Malmsey Muscadine, and White S
water.

Eighty-six of the varieties have been cultiva
Welbeck within the last seven years, but only
fourteen found of superior excellence, and ma
the others were mere synonymes. Mr. Tillery,

his long course of experience and observation, recommends the following selections :—

For the Earliest House.—The Purple Constantia, or Frontignan, White Frontignan, Black Prince, Dutch or Stillward's Sweetwater, Black Hamburgh, and Tripoli.

For Stove.—White Muscat of Alexandria, Purple Constantia, White Frontignan, Grizzly Frontignan, Black Muscat, and Black Damascus.

For Greenhouse.—Black Hamburgh, Tripoli, Grove-end Sweetwater, and Muscadine.

For Latest House.—West's St. Peter's and Charlesworth's Tokay.

For a Single House with fourteen rafters.—One Purple Constantia, one White Frontignan, one Royal Muscadine, or Chasselas D'Arboyce, three Muscats, three Black Hamburghs, or Tripolis, three West's St. Peter's, and two Black Princes.

For Pot-Culture, to cover in during April and May.—Purple Constantia and White Frontignan. *(United Gard. Journ.)*

Admiral. See Black Hamburgh.

Aleatico (du Po). See Miller's Burgundy.

Aleppo (Raisin d'Alep. Maurillon Panaché, Maurillon noir Panaché, Chasselas Panaché, Raisin Suisse, Striped Muscadine, Variegated Chasselas, Switzerland). Bunch loose, berries white and red, round, skin thin, sweet, quality good, leaves and berries striped, and otherwise varying in colour ; leaf's diameter $12\frac{1}{2}$ inches, footstalk's length 6 inches.

Alexandrian Ciotat. Bunch long, colour yellow and white, berries oval, skin thin, sweet, quality good, hothouse and vinery, sets irregularly.

Alexanders (Schuylkill Muscadine). Bunch small, colour blackish, berries oval, skin thick, quality bad; a fox grape.

Alicant. See Black Prince.

Alicante Bianca.

Alicante Preto. See Cornichon Blanc.

Almeria. See Hamburgh, White.

Amazon, Red.

Amiens. See Royal Muscadine.

Anguur Kismisi. See White Corinth.

Ansley's Large Oval Black. See Black Morocco.

Ascalon, Black. See Black Corinth.

Aramon.

Arbst. See Black Cluster.

Aspirant (de l'Herault). Bunch compact, colour blackish, berries round, skin thick, quality middling; a wine grape.

Aspirant sans Pepin. See White Corinth.

Astracan, Large (Saffiannoi).

Astracan, Large Red Berried.

D'Arbois. See Royal Muscadine.

D'Arboyce, of Speechley. See *ibid.*

Augustiner. See Black Cluster and Early Black July.

Auvernat. See Black Cluster.

Auvergne. See *ibid.*

Auvernas Rouge. See *ibid.*

Auvernas, Vrai. See *ibid.*

Bec d'Oiseau. See Cornichon Blanc.

Bela Dinca. See White Frontignan.

Black Britannia.

Black Cluster (Auvernat, Burgundy, Black Burgundy, Early Black, Small Black Cluster, Black Morillon, Auvergne, True Burgundy, Pineau, Franc-

Pineau, Morillon Noir, Raisin de Bourgogne, Auvernas Rouge, Vrai Auvernas, Saumoireau, Bon Plant, Genetin de St. Menin, Fin Noir de Toulon, Talvagnues Rouge, Ternent, Fin Plant Doré, Noirin, Pignolet, Pignola, Nera, Klevner, Burgunder, Rother, Schwarzer, Rother Burgunder, Schwarzer Sussling, Sussedel, Augustiner, Fruhblaue, Klebroth, Blauer Seeklevner, Blauer Rischling, Schwarzer Rissling, Schwarze Frankische, Mohrenkonigin, Malterdinger, Arbst, Bohmischer, Cerna Okrugla, Ranka Druge Struke). Bunch compact, colour blackish, berries roundish oval, skin thick, sweet, quality middling, wall; leaf's diameter 5 inches, footstalk's length 3 inches.

Black Cluster, of Miller. See Miller's Burgundy.

Black Cluster, scarlet-leaved (Large Black Cluster). Bunch small, colour blackish, berries oval, skin thick, quality bad, wall; a wine grape; leaf's diameter 6 inches, footstalk's length 4 inches.

Black Cluster, nice. Bunch loose, colour blackish, berries roundish, skin thin, sweet, quality middling, wall.

Black July, Early (Morillon Hatif, Madeleine, Madeleine Noire, Raisin Précoce, De St. Jean, De Juillet, Sehr Fruher Schwarzer Burgunder, Schwarzer Burgunder, Fruher Burgunder, Schwarzer Fruhzeitiger Burgunder, August Traube, Augustiner, August-Clevner, Jacobstraube, Fruhe Jacobstraube, Jacobitraube, Champagner, Fruhes Mohrchen, Ranczi, Juannens Negrés, Lujega, Luviana, Lugiana Veronese, Lugliana e Lugliola dei Toscani). Bunch compact, colour blackish, berries round, skin thick, sweet, quality middling, wall, the earliest; leaf's diameter 6 inches, footstalk's length 4 inches.

Black Prince (Sir Abraham Pytches' Black, Alicant, Black Spanish, Black Valentia, Black Portugal, Black Lisbon, Pocock's Damascus, Cambridge Botanic Garden, Lombardy of some, Steward's Black Prince, Boston). Bunch long, colour blackish, berries oval, skin thick, sweet, quality good, vinery and wall; leaf's diameter $10\frac{1}{2}$ inches, footstalk's length 5 inches.

Black Prince, Williams's.

Black Prolific. Bunch loose, colour blackish, berries roundish, skin thin, sweet, quality good, vinery and wall, early and prolific.

Blacksmith's White Cluster, see Scotch White Cluster.

Blanc de Bonneuil, see Early White Malvasia.

Blanche. Bunch large, colour pale and green, berries oval, skin thin, sweet, quality good, vinery and wall, ripens early.

Bland's Virginian (V. Blanda, V. Labrusca Blanda, Bland's Fox Grape). Bunch small, colour pale and red, berries round, skin thick, foxy, quality bad; a variety of V. Labrusca.

Blauer Seeklevner, see Black Cluster.

Blood Red, see Claret.

Blussard Blanc.

Blussard Noir.

Bocksaugen, see Black Hamburgh.

Bohmischer, see Black Cluster.

Bommerer, see Black Hamburgh.

Bon Plant, see Black Cluster.

Bordelais, see Verjus.

Boston, see Black Prince.

Boudales, des Hautes Pyrenees, see Black Frontignan.

Bual, White. Bunch compact, colour white, berries obovate, skin thick, sweet, quality good, vinery and wall.

Burgunder, see Black Cluster.

Burgunder, Fruher, see Early Black July.

Burgunder, Fruhzeitiger Swarzer, see *ibid.*

Burgunder, Rother, see Black Cluster.

Burgunder, Schwarzer, see Early Black July.

Burgunder Sehr Fruher Schwarzer, see *ibid.*

Burgundy, see Black Cluster.

Burgundy Black, see *ibid.*

Burgundy, Miller's Black Cluster, of Miller (Le Meunier, Miller, Aleatico du Po, Maurillon Taconné, Fromenté, Resseau, Farineux Noir, Savagnien Noir, Noirin, Muller, Mullerrebe, Mullerweib, Pulverulenta, Morone Farinaccio). Bunch compact, colour blackish, berries round, skin thin, sweet, quality good, wall. An old variety, named from the hoary pubescent or mealy colour of its leaves; a first-rate wine grape; succeeds on the open wall; leaf's diameter 5½ inches, footstalk's length 3½ inches.

Buttuna di Gattu, see Cornichon Blanc.

Cambridge Botanic Garden, see Black Prince.

Cape, Red.

Carazon de Cabrito, see Cornichon Blanc.

Caswall's Small Black.

Catelunesia Nera.

Cerna Okrugla, see Black Cluster.

Champagner, see Early Black July.

Catesby's.

Cephalonian. Bunch loose, colour rosy, berries oval, skin thin, sweet, quality middling, vinery.

Chasselas, see Royal Muscadine.

Chasselas de Bar Sur Aube.

Chasselas, Morna, see Early White Malvasia.

Chasselas Panache, see Aleppo.

Chasselas de Fontainebleau, see Royal Muscadine.

Chasselas Dore, see Royal Muscadine.

Chasselas Hatif Petit. Bunch loose, colour pale green, berries round, skin thin, sweet, quality middling, wall.

Chasselas, Knight's Variegated. Bunch loose, colour yellow and white, berries round, skin thin,

sweet, quality middling, vinery and wall, res
the Aleppo.

Chasselas Musque. Bunch loose, colour
berries round, skin thin, muscat quality, vine
wall, excellent.

Chasselas Noir.

Chasselas Precoce, see White Sweetwater.

Chasselas Red (Chasselas Rouge). Bunch
colour red, berries round, skin thin, sweet,
middling, vinery and wall.

Chasselas Rose.

Chasselas White, see Royal Muscadine.

Chasselas Rouge Royale.

Chasselas Royale, see White Sweetwater.

Chasselas Variegated, see Aleppo.

Ciotat (Parsley-leaved, Parsley-leaved Mus
Raisin d' Autriche, White Parsley-leaved, M
Muscadine, Petersilien Traube, Geschlittbla
Gutedel, Spanischer Gutedel, Peterselyer
Bunch long, colour white, berries round, skin
sweet, quality middling, vinery, easily disting
by its much divided leaves; leaf's diameter 12 i
foot-stalk's length 6½ inches.

Clairette.

Clairette Blanche, de l'Herault.

Clairette Rose. Bunch long, colour whit
red, berries oval, skin thin, sweet, quality mid
vinery and wall.

Claret (Blood Red). Bunch compact,
blackish, berries roundish oval, skin thick,
quality middling, vinery, leaves become red to
autumn; juice claret-coloured throughout the
leaf's diameter 6 inches, footstalk's length 4½ in

Clevner August, see Early Black July.

Cochin China. Bunch large, colour bla
berries oval, skin thick, sweet, quality middling,
house.

Constantia, Black, see Black Frontignan.
Constantia, Nepean's, see White Frontignan.
Constantia, Purple, see Black Frontignan.
Constantia, Red, see Grizzly Frontignan.
Constantia, White, see White Frontignan.
Corinth (Des Dames).

Corinth Black (Zante, Black Ascalon, Currant, Corinth Violette, Corinth Noir du Moree, Passeretta Nera). Bunch small, colour blackish, berries round, skin thin, sweet, quality middling, vinery, stoneless; the black currant of the shops.

Corinth, White (White Kishmish, Stoneless Round-berried, Corinth Blanc, Passe, Raisin De Passe, Passerille, Aspirant sans Pepin, Passerina, Passeretta Bianca, Passa Cilicia, Popula Cilicia, Passulo Chesemino, Zedig, Kischmisch, Anguur Kismisi). Bunch small, colour white, berries round, skin thin, sweet, quality middling, vinery, stoneless, and forms one of the kinds of Sultana raisins of commerce; leaf's diameter $5\frac{1}{2}$ inches, footstalk's length 4 inches.

Cornichon Blanc (Finger, White Cucumber Grape, Pinquant Paul, Bec d'Oiseaux, Santa Paula, Teta de Vaca, Alicante Preto, Doigts de Donzelle, Carazon de Cabrito, Uva Ciolinna, Pizutello Bianco, Buttuna di Gattu, Kummerling Traube, Weisser Spitzwelscher). Bunch loose, colour white, berries elliptic, skin thick, sweet, quality middling, hothouse, keeps long; leaf's diameter $9\frac{1}{2}$ inches, footstalk's length 5 inches.

Cornichon, Violet. Bunch loose, colour red, berries elliptic, skin thick, sweet, quality middling, hothouse, resembles the Cornichon Blanc except in colour.

Coussi Noir (Querci Noir).
Cumberland Lodge, see Esperione.
Currant, see Black Corinth.

Damascus, Black (Worksop Manor Grape). Bunch large, colour blackish, berries round, skin thin, sweet, quality good, hothouse, late; valuable, but rather shy bearer, owing to a deficiency of pollen, which may be obviated by growing it near a Royal Muscadine; leaf's diameter 11 inches, footstalk's length $5\frac{1}{2}$ inches.

Damascus, Pocock's, see Black Prince.

Damson. Colour purple, berries oval, skin thick, harsh, quality bad, hothouse; austere purple juice; leaf's diameter 10 inches, footstalk's length $5\frac{1}{2}$ inches.

De Candolle.

Dedo des Dama, or *Lady's Finger.* Leaf's diameter 11 inches, footstalk's length $5\frac{1}{2}$ inches.

Des Dames, see Corinth.

Diagalvis, White. Colour white, berries obovate, skin thick, sweet, hothouse, very late; leaf's diameter 10 inches, footstalk's length 5 inches.

Doigts de Donzelle, see Cornichon Blanc.

Dreimanner, see Red Traminer.

Durensteiner, see White Rissling.

Elford.

Elsingburgh (Smart's Elsinburg, V. Elsinburghii). Bunch compact, colour purple, berries round, skin thick, foxy, quality bad, wall; a variety of V. Labrusca.

Esperione (Hardy Blue Windsor, Turner's Black, Cumberland Lodge, Red Port, of some). Bunch large, colour purple, berries round, skin thick, sweet, quality middling, vinery and wall; a hardy prolific grape.

Farineux Noir, see Miller's Burgundy.

Ferrar, Black.

Ferrar Large Black. Bunch large, colour blackish, berries oval, skin thick, sweet, hothouse and vinery; allied to Black Morocco.

Fin Noir de Toulon, see Black Cluster,

Fin Plant Dore, see *ibid.*

Finger, see Cornichon Blanc.

Fleisch Traube, see Black Hamburgh.

Frankenthaler Gros Noir, see Black Hamburgh.

Frankische Traube Rothe, see Red Traminer.

Four Oaks (Warwickshire Seedling). Bunch large, colour blackish, quality middling.

Fromente, see Miller's Burgundy.

Fromenteau, see Red Traminer.

Fromentin Rouge, see *ibid.*

Frankendale, see Black Hamburgh.

Frankenthaler, see *ibid.*

Frontignan Alexandrian, see White Muscat of Alexandria.

Frontignan Black (Muscat Noir, Sir William Rowley's Black, Muscat Noir Ordinaire, Purple Frontignan, Purple Constantia, Black Constantia of some, Red Frontignan of some, Boudales des Hautes Pyrenees, Muscat Rouge of some, Muscat Noir de Jura, Schwarzer Muscateller, Schwarzer Weihrauch, Schwarze Schmeckende). Bunch long, colour blackish, berries round, skin thin, muscat, quality good, hothouse vinery and wall, good bearer. Although usually considered synonymous, I do not think this the same as the Purple Constantia; the latter came from the Cape of Good Hope. Leaf's diameter 12 inches, footstalk's length 6½ inches.

Frontignan, Blue (Violet Frontignan of some, Black Constantia of some). Bunch compact, colour purple, berries roundish, skin thick, slightly muscat, quality middling, vinery; leaf's diameter 6½ inches, footstalk's length 4 inches.

Frontignan, Grizzly (Red Frontignan when more coloured, Muscat Gris, Muscat Rouge, Moscado Rosso, Moscatel Menudo, Kummel Traube, Rother Muscateller of some, Brauner Muscateller, Grauer Muscateller, Rother Schmeckende, Rother Weihrauch, Grizeline, Red Constantia). Bunch long, colour yellow and red, berries round, skin thick, muscat, hothouse and vinery, excellent; leaf's diameter 11 inches, footstalk's length 6½ inches.

Frontignan White (White Constantia, Nepean's Constantia, Muscat Blanc, Raisin de Frontignan, Muscat Blanc de Jura, Moschata Bianca, Moscat Bianco, Moscado Bianco, Mascatello Bianco, Moscatel Commun, Moscatel Menudo Blanco, Moscatel Morisco, Muscateller, Weisser Muscateller, Weissgelber Muscateller, Weisse Muscaten Traube, Schmeckende, Weyrer, Muscataly, Muscat Beli, Bela Dinka, Zoruna). Bunch large, colour white, berries round, skin thin, muscat, quality good, hothouse vinery and wall; by many esteemed the best, however the black Grizzly and white Frontignans differ little except as regards colour; but the blue Frontignan is very different, being somewhat oval, with scarcely any muscat flavour; leaf's diameter 11 inches, footstalk's length 7 inches.

Fruhtrauben, see Early White Malvasia.

Fruh Leipziger, see *ibid.*

Geschlittblattriger Gutedel, see Ciotat.

Genetin de St. Menin, see Black Cluster.

Gibraltar, black, see Black Hamburgh and Black Morocco.

Graefenberger, see White Rissling.

Grange's Seedling, White. Bunch compact, colour white, berries ovate, skin thick, sweet, quality middling, vinery.

Graschevina, see White Rissling.

Greek (Green Chee). Bunch long, colour greenish white, berries oval, skin thin, sweet, quality middling, vinery; leaf's diameter 6½ inches, footstalk's length 3 inches.

Gris Rouge, see Red Traminer.

Grizeline, see Grizzly Frontignan.

Gros Noir Musque.

Gros Rouge de Provence. Bunch loose, colour blackish, berries roundish oval, skin thick, sweet, quality middling, hothouse and vinery, hangs late.

Grunelbling, see White Rissling.

Gutedel Schwarzer of some, see Black Hamburgh.

Gutedel Spanischer, see Ciotat.

Hamburgh, black (Warner's, Warner's Black Hamburgh, Purple Hamburgh, Red Hamburgh, Brown Hamburgh, Dutch Hamburgh, Hampton Court Vine, Valentine's, Gibraltar, Black Gibraltar, Black Portugal of some, Black Teneriffe, Salisbury Violet, Victoria, Admiral, Frankendale, Frankenthaler, Frankenthaler Gros Noir, Trollinger, Blue Trollinger, Pale-wooded Trollinger, Troller, Welscher, Schwarzwelscher, Fleish Traube, Hudler, Mohrendutte, Malvasier of some, Languedoc, Schwarzer Gutedel of some, Gelbholziger Trollinger, Weissholziger Trollinger, Schwarzblauer Trollinger, Bocksaugen, Bommerer, Lugiana Nera). Bunch large, colour blackish, berries roundish, skin thick, sweet, quality good, hothouse and vinery; most commonly cultivated, and best for a general crop; leaf's diameter 13½ inches, footstalk's length 7 inches.

Hamburgh, Braddick's Seedling. Bunch large, colour blackish, berries roundish, skin thick, sweet, quality good, hothouse and vinery; resembles Black Hamburgh.

Hamburgh, Wilmot's New Black (Wilmot's Dutch Hamburgh). Bunches small, loose, berries large and uneven, flesh firm, flavour good.

Hamburgh, White (White Lisbon, White Portugal, White Raisin, Almeria). Bunch loose, colour white, berries oval, skin thick, slight Muscat, quality middling, hothouse; is the Portugal grape of the shops; leaf's diameter 12 inches, footstalk's length 6½ inches.

Hampton Court Vine, see Black Hamburgh.

Hardy Blue Windsor, see Esperione.

Hardy Purple, Harrison's. Bunch compact, colour pale, blackish and red, berries round, skin thin, sweet, quality middling, vinery and wall; allied to Burgundy.

Hickling's White Seedling.

Horsforth Seedling (Rhodes's). Bunch large, colour blackish, berries oval, skin thick, sweet, quality middling, hothouse and vinery, very similar to Black Morocco. This was raised at Horsforth Hall, near Leeds, about the year 1820; it does not set well.

Hubshee (Kalee).

Hudler, see Black Hamburgh.

Inistiogue. Bunch compact, colour white, berries round, skin thin, sweet, quality middling, vinery and wall.

Isabella (V. Isabella, V. Labrusca Isabella). Bunch loose, colour purple, berries oval, skin thick, foxy, quality bad, wall; variety of V. Labrusca.

Jacobstraube, see Early Black July.

Jacobstraube, Fruhe, see *ibid.*

Jouanen Tres Precoce.

Juannens Negres, see Early Black July.

De Juillet, see *ibid.*

Kalee, see Hubshee.

Kienzheimer Blanc Precoce.

Kischmisch, see White Corinth.

Kishmish, Large Stoneless.

Kishmish, White, see White Corinth.

Klebroth, see Black Cluster.

Kleinbrauner, see Red Traminer.

Klevner, see Black Cluster.

Klevner, Rother, see Red Traminer.

Klingelberger, see White Rissling.

Krauses, see Rissling.

Kummel Traube, see Grizzly Frontignan.

Kummerling Traube, see Cornichon Blanc.

Lady's Finger, see Dedo des Dama.

Languedoc, see Black Humburgh.

Large Black, Bound's.

Large White, Savage's.

Lashmar's Seedling. White, good bearer, flavour excellent, skin thin; ripens a fortnight earlier on open walls than any other grape. (*Gard. Journ.* 1846, 43.)

Lisbon, White, see White Hamburgh.

Lisbon, Black, see Black Prince.

Lombardy (Flame-coloured Tokay, Red Rhenish, Wantage, Red Grape of Taurida). Bunch large, colour red, berries round, skin thick, sweet, quality middling, vinery and wall; leaf's diameter 11½ inches, footstalk's length 7 inches.

Lombardy, Black (West's St. Peter's, Money's West's St. Peter's, Poonah, Raisin des Carmes, Raisin de Cuba). Best late grape, bunch large, colour blackish, berries roundish oval, skin thin, sweet, quality good, hothouse. Grapes will hang until the end of February; brought from Bombay in 1817: it should be grafted on a Black Hamburgh.

Lombardy, of some, see Black Prince.

Longford's Incomparable, resembles Black Prince.

Lugiana Nera, see Black Hamburgh.

Lugiana Veronese, see Early Black July.

Lugliana e Lugliola dei Toscani, see *ibid.*

Lujega, see *ibid.*

Lunel, see White Muscat of Alexandria.

Luviana, see Early Black July.

Madeira, Red.

Madeira, White.

Madeleine, see Early Black July.

Madeleine Blanche.

Madeleine Noire, see Early Black July.

Malaga, see White Muscat of Alexandria.

Malaga, du Lot. Bunch compact, colour blackish, berries round, skin thick, sweet, quality middling, wall; early, like Black Cluster.

Malmsey.

Malterdinger, see Black Cluster.
Malvasier of some, see Black Hamburgh.
Malvoisie, see Blue Tokay.
Mattock's Seedling.
Malvasia Negra.
Malvasia, Early White (Grove-end Sweetwater, White Melier, Le Melier, Melier Blanc, Mornain Blanc, Morna Chasselas, Blanc de Bonneuil, Grosserer Fruher Malvasier, Fruhtrauben, Fruh Leipsiger, Seidentraube). Colour white, berries round, skin thin, sweet, quality good, vinery and wall, a good bearer.
Maroquin d'Espagne.
Marzimmer, see Red Traminer.
Marseilles.
Maurillon Hatif, see Early Black July.
Maurillon Noir Panache, see Aleppo.
Maurillon Taconne, see Miller's Burgundy. *
Melier, White, see Early White Malvasia.
Le Meunier, see Miller's Burgundy.
Mignonne White Cluster. Bunch small, colour white, berries round, skin thin, sweet, quality good, wall.
Miller, see Miller's Burgundy.
Mohrchen Fruhes, see Early Black July.
Mohrendutte, see Black Hamburgh.
Mohrenkonigin, see Black Cluster.
Morillon, black, see Black Cluster.
Morillon Noir, see *ibid.*
Mornain Blanc, see Early White Malvasia.
Morocco, black (Ansley's Large Oval Black, Black Muscadel, Black Raisin and Black Gibraltar of some, Red Muscatel of some, Le Cœur). Bunch large, colour dark red, berries oval, skin thick, sweet, quality middling, hot-house. If this be the real Rasin Grape, it produces fruit on its lateral shoots in succession, so that ripe fruit, green fruit, and blossoms are to be seen at once: its berries are very unequal, unless it is

grafted upon a Syrian or other robust stock. Leaf's diameter $9\frac{1}{2}$ inches, footstalk's length $5\frac{1}{2}$ inches.

Morone Farinaccio, see Miller's Burgundy.

Moscado Bianco, see White Frontignan.

Moscado Rosso, see Grizzly Frontignan.

Moscat Bianco, see White Frontignan.

Mosctello Bianco, see *ibid.*

Moscatel Commun, see *ibid.*

Moscatel Menudo Blanco, see *ibid.*

Moscatel Menudo Moscado, see Grizzly Frontignan.

Moscatel Morisco, see White Frontignan.

Moschata Bianca, see *ibid.*

Muller, *Mullerrebe*, *Mullerweib*, see Miller's Burgundy.

Muscadel (White Muscadel).

Muscadel, black, see Black Morocco.

Muscadel, red, see *ibid.*

Muscadine, Amber, see Royal Muscadine.

Muscadine, black. Bunch compact, colour blackish, berries oval, skin thick, sweet, quality middling, vinery; leaf's diameter 9 inches, footstalk's length 5 inches.

Muscadine, parsley-leaved, see Ciotat.

Muscadine, Carolina.

Muscadine, New Dwarf.

Muscadine, Malmsey, see Ciotat.

Muscadine, Royal (Amber Muscadine, Common Muscadine, Early White Teneriffe, Chasselas, Chasselas Dore, Chasselas de Fontainebleau, D'Arbois, D'Arboyce of Speechley, White Chasselas, Pearl of some, Raisin de Champagne, Amiens). Bunch large, colour white, berries round, skin thin, sweet, quality good, vinery and wall, good for the open wall; ripe in September, and will hang on the vine two months longer; leaf's diameter $12\frac{1}{2}$ inches, footstalk's length 7 inches.

Muscadine, Braddick's White (Braddick's Sweetwater). Bunch large, colour white, berries round, skin thin, sweet, quality middling, vinery and wall, very like the Royal Muscadine.

Muscadine, Schuylkill, see Alexander's.

Muscadine, striped, see Aleppo.

Muscat of Alexandria, black (Red Muscat of Alexandria, Escholata Superba? Black Raisin of some). Bunch large, colour blackish, berries oval, skin thick, muscat, quality good, hothouse.

Muscat of Alexandria, white (Alexandrian Frontignan, Muscat of Jerusalem, White Muscat, Tottenham Park Muscat, White Tokay of some, Lunel, White Muscat of Lunel, Malaga, Passe-Musquée, White Passe-Musquee, Passe-longue Musquee, Muscat Eschcolota, Zebibo of Sicily, Round Muscat of Alexandria, improperly). Bunch long, colour white, berries oval, skin thick, muscat, quality good, hothouse; requires a very high temperature; diameter of leaf 12 inches, length of footstalk 8½ inches.

Muscat Beli, see White Frontignan.

Muscat Blanc, see *ibid.*

Muscat Blanc Dore.

Muscat Blanc de Jura, see White Frontignan.

Muscat (*Canon Hall*). Bunch long, colour white, berries oval, skin thick, muscat, quality good, hothouse; scarcely so high flavoured as the White Muscat of Alexandria.—To get the Cannon Hall Muscat to set properly, with a pair of grape scissors cut out the flowers by threes and fours at the small shoulders where they are clustered by dozens, leaving room for two berries only when well swelled. As soon as the flowers expand brush them over daily with a camel's-hair brush, so that they may be well dusted with pollen. (*Gard. Chron.* 1841, 309.)

Muscat d'Espagne.

Muscat Gris, see Grizzly Frontignan.

Muscat Noir and *Muscat Noir Ordinaire,* see Black Frontignan.

Muscat Noir de Jura, see *ibid.*

Muscat Rouge, see Grizzly Frontignan and Black Frontignan.

Muscat, Violet.

Muscat of Lunel, white, see White Muscat of Alexandria.

Muscat, Zante.

Muscateller, Brauner, see Grizzly Frontignan.

Muscateller, Grauer, see *ibid.*

Muscataly, see White Frontignan.

Muscateller, see *ibid.*

Muscateller Schwarzer, see Black Frontignan.

Muscateller Weisser, see White Frontignan.

Muscateller Weissgelber, see *ibid.*

Muscateller Rother, see Red Traminer and Grizzly Frontignan.

Muscaten Traube, Weisse, see White Frotignan.

Negro Molle.

Nere, see Black Cluster.

Niederlander, see White Rissling.

Nice, black.

Nice, white. Bunch loose, colour greenish white, berries roundish, skin thin, sweet, quality middling, vinery, bunches very large, with loose shoulders.

Noirin, see Miller's Burgundy and Black Cluster.

Œillaude.

Olivette.

Olwer.

Ortlieber.

Oswigsburgh (V. Oswigsburghii, Schuylkill). Colour white, berries round, skin thick, foxy, quality bad, wall, musky harsh flavour, a variety of V. Labrusca.

Palestine, black, see Black St. Peter's.

Parmata Cluster.

Parsley-leaved, see Ciotat.
Parsley-leaved, white, see *ibid.*
Passe-Musquee, see White Muscat of Alexandria.
Passe-Musquee, white, see *ibid.*
Passe-Longue, Musquee, see *ibid.*
Passa-Cilicia, see White Corinth.
Passeretta Bianca.
Passerille, Passerina, see *ibid.*
Passeretta Nera, see Black Corinth.
Passulo Chesemino, see White Corinth.

Pearl. Bunch long, colour bluish white, berries round, skin thin, sweet, quality middling, wall.

Pearl, of some, see Royal Muscadine.

Petersburgh (Black St. Petersburgh). Bunch loose, colour blackish, berries round, skin thick, sweet, quality good, vinery.

Peterselyer Szolo, see Ciotat.
Petersilien Traube, see *ibid.*
Pignola, see Black Cluster.
Pignolet, see *ibid.*
Pineau, see *ibid.*
Pineau-Franc, see *ibid.*
Pinquant Paul, see Cornichon Blanc.

Pitmaston White Cluster. Bunch compact, colour white, berries round, skin thin, sweet, quality good, vinery, and ripens on a wall.

Pizutello, see Cornichon Blanc.
Poonah, see Black Lombardy.
Poonah, long black.
Popula Cilicia, see White Corinth.
Portugal, see White Hamburgh.
Portugal, black, see Black Prince and Black Hamburgh.

Portugal, amber-coloured. Bunch compact, colour white, berries ovate, skin thick, sweet, quality middling, vinery.

Port Wine, see Red Port.

Pulverulenta, see Miller's Burgundy.
Ranczi, see Early Black July.
Raisin d'Alep, see Aleppo.
Raisin d'Autriche, see Ciotat.
Raisin, black, see Black Morocco and Black Muscat of Alexandria.
Raisin d'Bourgogne, see Black Cluster.
Raisin de Cuba, see Black Lombardy.
Raisin de Calabre.
Raisin de Passe, see White Corinth.
Raisin Suisse, see Aleppo.
Rischling Blauer, see Black Cluster.
Raisin des Carmes, see Black Lombardy.
Raisin de Champagne, see Royal Muscadine.
Raisin de Frontignan, see White Frontignan.
Raisin Precoce, see Early Black July.
Raisin Rouge de Schlossberg a Kreuznach.
Raisin, white, see White Hamburgh.
Ranka Druge Struke, see Black Cluster.
Ran Folka, see Red Traminer.
Ran Foliza, see *ibid*.
Red Grape of Taurida, see Lombardy.
Red Port (Port Wine).
Red Port, of some, see Esperione.
Red Rosewater (Rother Gulabe).
Rhenish, red, see Lombardy.
Resseau, see Miller's Burgundy.
Rhodes's, see Horsforth Seedling.
Rissling Schwarzer, see Black Cluster.
Rissling, white (Schloss Johannisberg, Rudesheimerberg, Grafenberger, Rissling, Petit Rissling, Weisser Rissling, Kleiner Rissling, Risslinger, Riessling, Gewurtz Riessling, Riessler, Grosser Riessling, Gruner Reissler, Rossling, Rosslinger, Russel, Klingelberger, Niederlander, Krauses, Graschevina, Durensteiner, Grunelbling). Colour whitish green, bunch compact, berries round, skin thin, sweet, quality good,

wall ; a wine grape, much esteemed as such in the Rhine district.

Robola.

Rothclauser, *Rothklaber*, *Rothedel*, and *Rothfranken*, see Red Traminer.

Rossling, see White Rissling.

Rosslinger, see *ibid.*

Rothe Reifler, see Red Traminer.

Rother, see Black Cluster.

Rother Gulabe, see Red Rosewater.

Rudesheimerberg, see White Rissling.

Russel, see *ibid.*

Saffiannoi, see Large Astrachan.

Santo Paulo, see Cornichon Blanche.

Sahibee. Colour yellowish white, bunch compact, berries oval, skin thick, sweet, quality middling, vinery and hothouse; appears well adapted for early forcing.

Saint Albans, Joslin's. Raised by Mr. Joslin, nurseryman, St. Albans, in 1839: berries yellow, round, flesh moderately firm, rich, sweet, and flavour Frontignan. Probably a hybrid between the White Nice and Muscat. (*Hort. Soc. Journ.* i. 296.)

Saint Clauser, see Red Traminer.

Saint Jean, see Early Black July.

Saint Peter's, black (St. Peter's, Black Palestine, Oldaker's West's Saint Peter's). Colour blackish, bunch loose, berries round, skin thin, sweet, quality good, vinery; ripens late, and if not forced early will hang till March; leaf's diameter 10 inches, footstalk's length 7 inches.

Saint Peter's, West's, see Black Lombardy.

Saint Peter's, Money's West's, see *ibid.*

St. Petersburgh, black, see Petersburgh.

Salisbury Violet, see Black Hamburgh.

Saumoireau, see Black Cluster.

Savagnien Noir, see Miller's Burgundy.

Savagnien Blanc.

Schloss Johannisberg, see White Rissling.
Schmeckende, see *White Frontignan.*
Schmeckende, Rother, see Grizzly Frontignan.
Schmeckende, Schwarzer, see Black Frontignan.
Schuylkill, see Oswigsburg.
Schwarzer, see Black Cluster.
Schwarzer Sussling, see *ibid.*
Schwarzwelscher, see Black Hamburgh.
Seiden Traube, see Early White Malvasia.
Scuppernong, Black.
St. Emilion.
Sicilian, Large Black.
Sicilian, Large White.
Sir Abraham Pytche's Black, see Black Prince.
Sir William Rowley's Black, see Black Frontignan.

Spence's Seedling. Bunch loose, colour white, berries oval, skin thick, sweet, quality middling, hot-house and vinery; resembles Syrian.

Spitzwelscher Weisser, see Cornichon Blanc.
Steinberger.

Stoneless Oval-berried. Bunch small, colour white, berries oval, skin thin, sweet, quality middling, vinery and wall, stoneless, like the White Corinth, but oval.

Stoneless Round-berried, see White Corinth.
Sussedel, see Black Cluster.

Sweetwater, Black (Water Zoet Noir). Bunch compact, colour blackish, berries round, skin thin, sweet, quality middling, vinery and wall; leaf's diameter 9 inches, footstalk's length $3\frac{1}{2}$ inches.

Sweetwater, Braddick's, see Braddick's White Muscadine.

Sweetwater, Dutch, see White Sweetwater.
Sweetwater, Grove-end, see Early White Malvasia.
Sweetwater, Lord Bagot's.
Sweetwater, New.

Sweetwater, white (Stillward's Sweetwater, Dutch Sweetwater, Water Zoet Blanc, Chasselas Precoce, Chasselas Royale). Bunch open, colour white, berries round, skin thin, sweet, quality good, hothouse, vinery and wall; apt to set badly, especially if the vines are old; leaf's diameter 9 inches, footstalk's length 4 inches.

Syracuse, red. Bunch loose, colour red, berries oval, skin thick, quality middling, hothouse; leaf's diameter 11 inches, footstalk's length 6 inches.

Syrian. Bunch large, colour white, berries oval, skin thick, sweet, quality middling, hothouse, flesh firm, hangs long; leaf's diameter $17\frac{1}{2}$ inches, footstalk's length 6 inches.—This is supposed to be the sort of grape which the spies, sent by Moses to view Canaan, cut by the brook of Eshcol, and bare between two upon a staff (*Numb.* xiii. 23). Strabo testifies that the vines in Margiana and other places were so big that two men could scarcely compass them with their arms, and that they produced bunches of grapes two cubits or a yard long. Huetius informs us that Crete, Chios, and other islands of the Archipelago, afford bunches sometimes of forty pounds weight; and in this country, a bunch of the Syrian grape was produced at Wellbeck, under the care of Mr. Speechley, that weighed nineteen pounds and a half. Supposing the branch, with its cluster, brought by the spies, weighed forty or fifty pounds, as it was to be exhibited to the people, it was proper that the fruit should be preserved unbruised, which it could not have been without carrying it in the manner related. Accordingly, when the Duke of Portland sent his large cluster to the Marquis of Rockingham as a present, it was conveyed to Wentworth House, a distance of more than twenty miles, by four labourers, who carried it in pairs, by turns, suspended on a staff. Its greatest diameter was nineteen inches and a half, its circumference four feet and a half, and its length twenty-one inches and three-quarters.

Syrian, Leweston. Bunch loose, colour palish green, berries ovate, skin thick, sweet, quality middling, hothouse.

Switzerland, see Aleppo.

Talavagnues Rouge, see Black Cluster.

Teinturier, see Alicant.

Teneriffe, Early White, see Royal Muscadine.

Teneriffe, Black, see Black Hamburgh.

Terre Noire.

Ternent, see Black Cluster.

Teta de Vaca, see Cornichon Blanc.

Texas, Diverse-leaved.

Tinta. This and the Claret are grown abroad to colour the wines made from other grapes; its pulp clarety throughout.

Tokay, Black.

Tokay, Blue (Malvoisie). Bunch compact, colour blackish, berries roundish oval, skin thin, sweet, quality middling, hothouse and vinery; for wine rather than dessert; leaf's diameter 9 inches, footstalk's length 5 inches.

Tokay, Catawba. Bunch compact, colour white, berries round, skin thick, bad quality; American spreading.

Tokay, Charlesworth. Bunch compact, colour white, berries oval, skin thick, muscat flavour, quality good, vinery.

Tokay, Flame-coloured, see Lombardy.

Tokay, Genuine,

Tokay, White. Bunch compact, colour white, berries oval, skin thin, sweet, quality good, hothouse and vinery, abundant bearer; leaf's diameter 11 inches, footstalk's length 6 inches.

Tokay, White, of some, see White Muscat of Alexandria.

Tokayer, see Red Traminer.

Tripoli, Black. Bunch loose, colour blackish, berries round, skin thin, sweet, quality good, hothouse, late; leaf's diameter 11 inches, footstalk's length 5 inches.

Tripoli, Black, Welbeck. This is one of the best.

Troller, see Black Hamburgh.

Trollinger, see *ibid.*

Trollinger, Blue, see *ibid.*

Trollinger, Gelbholziger, see *ibid.*

Trollinger, Pale-wooded, see *ibid.*

Trollinger, Schwarzblauer, see Black Hamburgh.

Trollinger, Weissholziger, see *ibid.*

Traminer, Red (Gris Rouge, Fromentin Rouge, Fromenteau, Rother Traminer, Dreimanner, Traminer, Rother Klevner, Rothklaber, Rothedel, Rothfranken, Rothe Frankische Traube, Tokayer, Rother Muscateller, Kleinbrauner, St. Clauser, Rothclauser, Marzimmer, Ranfoliza, Ran Folak, Rothe Reifler). Bunch compact, colour reddish, berries roundish oval, skin thick, sweet aromatic, quality good, vinery and wall; a much esteemed wine grape.

Turner's Black, see Esperione.

Uva Ciolina, see Cornichon Blanc.

Valentia, Black, see Black Prince.

Valentine's, see Black Hamburgh.

Valtelin (Veltelin, Veltliner).

Van der Lahn Precoce.

Varney's Seedling. Bunch loose, colour blackish, berries round, skin thin, sweet, quality good, hothouse, late.

Verdal.

Verdelho. Bunch loose, colour yellowish green, berries small and oval, skin thin, sweet, quality good, vinery and wall, strong growing, Madeira wine grape.

Verjus or *Bordelais.* Berries large, oval; seldom ripens even in France, where it is grown to make verjuice.

Victoria, see Black Hamburgh.

Wantage, see Lombardy.
Warner's, see Black Hamburgh.
Warwickshire Seedling, see Four Oaks.
Water Zoet Blanc, see White Sweetwater.
Water Zoet Noir, see Black Sweetwater.
Weihrauch, Rother, see Grizzly Frontignan.
Weihrauch, Schwarzer, see Black Frontignan.
Welscher, see Black Hamburgh.
Weyrer, see White Frontignan.

White Cluster, Scotch (Blacksmith's White Cluster). Bunch compact, colour white, berries roundish oval, sweet, quality good, vinery and wall; hardy and early.

Worksop Manor, see Black Damascus.

Wortley Hall Seedling. Bunch large, colour blackish, berries oval, skin thick, sweet, quality middling, hothouse, very late.

Yellow Stoneless Seedling.

Yellow Spanish (Golden Galician). Leaf's diameter, $10\frac{1}{2}$ inches, footstalk's length 5 inches.

Zante, see Black Corinth.

Zebibo (of Sicily), see White Muscat of Alexandria.

Zedig, see White Corinth.
Zoruna, see White Frontignan.

CHARACTERISTICS OF EXCELLENCE.

The quality most desirable to be possessed by the grape is a pulp moderately firm, and rich in sugary, high-flavoured juice. The bunches should be rather large, weighing usually from 12 ounces to $1\frac{1}{2}$lb. The berries large, not crowded, and thin-skinned, yet not liable to burst. The vine should be a good bearer and free setter, that is, should produce pollen abundantly; otherwise, either much trouble is occasioned by the gardener having to collect pollen from more fertile vines, or the bunches will be irregular, and disfigured by vacancies occasioned by abortive berries. Early ripening is also an excellent quality, fitting it for culture both on the open wall and under glass. On walls, such a variety will ripen in most seasons, a short time elapsing between its blooming and the fruit ripening; and in the stove, forcing need not commence so early to obtain a crop at a desired period. With regard to form, if oval, the diameter of the berry should be three-fifths of its length; and, if globular, it cannot be too perfect a sphere. The size of the berries also should be uniform, for no bunch can be perfectly handsome which contains berries irregular either in size or form. There ought to be an unbroken bloom upon the berries. To obtain this, and to restore it, we shall give Mr. Gaven's directions, premising only that, though such artifice is permissable in preparing the fruit for table use, it is fraudulent if exercised when competing for a prize.

To preserve the bloom on the grape, complete the thinning of the berries when they have swelled to half their size, and be careful not to dash water violently against them, or subject them to a current of steam. Abundance of light and air are favourable for the production of bloom ; the most powerful sun will not injure it, nor a moderate degree of shade. When grapes with delicate bloom are gathered, they should be placed in a basket of well-thrashed moss, taking care not to bruise any of the berries, because their juice not only deprives other berries of their bloom, but renders it extremely difficult to restore that bloom by artificial means. To restore the bloom to grapes, suspend them in a box, and puff in, through a hole near the bottom in one of its sides, by means of a powder-puff, a little magnesia, at intervals of an hour or two. When not wanted for immediate use, they should be suffered to remain all night in the box; but, when a very delicate bloom is wanted, they should remain a few days. In no situation will they keep so well, and for so long a time, as in the blooming-box. Grapes require more care in packing than any other fruit. Mr. Gaven recommends moss and cotton wool, the former well threshed and carefully picked over. Place a layer of moss at the bottom of the box, on this a layer of cotton wool, and next, the bunches, side by side, within half an inch of each other; fill the interstices with cotton wool, place a layer of the same material over the fruit, and finish with a layer of moss. A false bottom, supported by the sides, may next be introduced, and the layers repeated according to the size of the box. Where the bunches are very large, it is necessary to introduce splints or slips of whalebone through the heavier parts of the bunches, and support them on the sides of the box, or on the interstices of cotton wool. Grapes are shewn for prizes on two distinct grounds, the one for size and delicate bloom, the other for flavour. In either case, when the bloom of any part of the bunch has been injured by handling, the puff may be directed against the part injured. Before fixing upon a bunch to show for flavour, it is necessary to taste the bunches in different parts of the house, or of different parts of the same vine. In general, the berries of the best flavour and colour are those of the first-ripened bunches (of the bunches at the root end of the vine), and of the lower extremity of the bunch. Grapes, unlike other fruits, do not improve in flavour after gathering; unripe bunches never get any riper after they are gathered. In selecting bunches, avoid those where any, or even one, of the leaves have been removed from the vine near the bunch, because the berries of bunches so circumstanced will certainly be of inferior flavour. Every one must have observed this in the case of gooseberries and currants. In dishing up grapes, the taste of the operator must be displayed according to the kinds and the size of the bunches; placing the largest in the centre, and the others round it, so as to form a handsome figure. Between dishing up and showing, keep them in a cool place. (*Gard. Mag.* iii. 39.)

PROPAGATION.

THE vine may be propagated by every mode known as applicable to plants.

By Seed.—In raising new varieties, which can only be done by this mode, seed from the largest, earliest, and best ripened berries must be separated from their pulp, and kept until the February following; then to be sown in pots filled with light fresh mould, and plunged in a moderately warm hotbed. They will come up in from four to six weeks; and when the plants are about six inches high, they should be transplanted singly into forty-eights, and afterwards into pots of larger size. Water gently as circumstances require; allow abundance of light and air, and carefully avoid injuring any of the leaves.

Six or eight seeds, if gathered from ripe grapes and carefully preserved through the winter, will be sufficient for a small pot, for, if sown too thick, the plants are apt to be drawn and weak. In dry weather water the pots gently every day; but in wet or moist weather give them so much water only as will keep the mould moist till the plants begin to vegetate. As the heat of the bed decays, add a lining of horse-dung, to be shaken up and repaired, as occasion requires, till the plants have got sufficient strength to do without any bottom heat.

About the end of August take the lights off, that the plants may be hardened before winter, taking care to shelter them in frames covered with mats, which will prevent the autumnal frosts from injuring the tender shoots.

When the plants are about six inches high, transplant them singly into other pots (deep forty-eights), filled with light fresh mould, taking great care not to hurt the roots, nor to break the leaders; then plunge them again into the hotbed; or if the heat of the old bed be too much decayed, have a new one prepared to receive them. If they grow vigorously, they must be shifted into larger pots (thirty-twos).

If the plants are above six inches high, tie them to small rods, as high as the frames will permit, leaving only one stem for the first year.

When the leaves begin to drop, pick them carefully off the pots, to prevent the plants from becoming mouldy.

Keep the plants under frames, or in the greenhouse, in hard winters, to shelter them from severe frost. After they are planted, cut them at the third eye, if strong; but at the second, if weakly: at the same time rubbing off the lower bud with the finger and thumb.

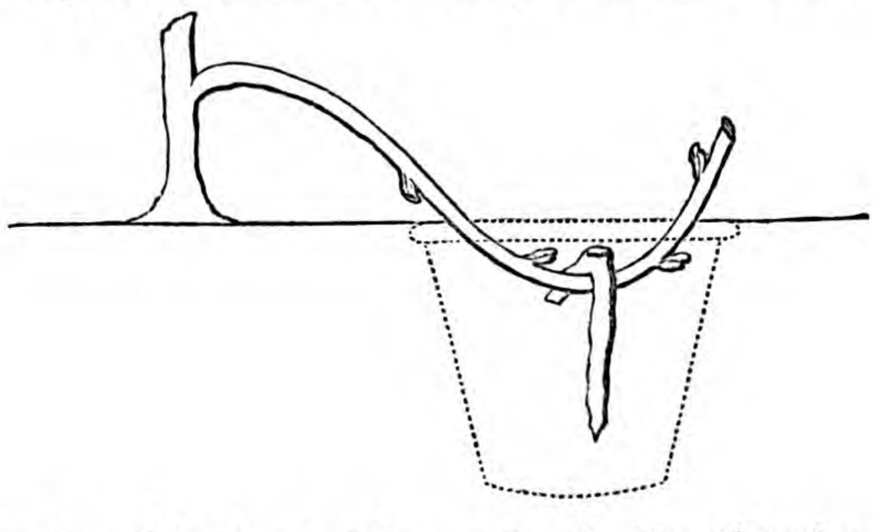
Cut down the plants every autumn to good buds, and suffer only one of these to extend itself in the following spring. Shift into large pots, as occasion requires, till they have produced fruit. This, under good management, will take place in the fourth or fifth year, when the approved sorts should be selected, and the rest destroyed, or used as stocks on which to graft or inarch good sorts. (*Loudon's Enc. of Gard.*)

If a hybrid grape be required, the stamens of the female parent must be cut away with very sharp-pointed scissars before their anthers have burst, and the pollen be applied to the stigma from the male desired to be the other parent. No very superior varieties have yet rewarded those who have attempted thus to improve the grape. (*Johnson's Dict. Mod. Gard.* 282.)

Mr. T. Appleby, gardener at the Fence, near Macclesfield, writing upon this subject, observes that a black grape, as good a bearer and as fine a fruit as the Black Hamburgh, with a Muscat flavour, is a desideratum. The most likely means to obtain this is, carefully to remove all the anthers from a bunch of Black Hamburg grapes before the pollen bursts and to use the pollen of Tokay or Muscat of Alexandria to set the bloom with, carefully excluding all the insects by a net bag till the berries are fairly set. (*Gard. Chron.* 1841, 611.)

Mr. Speechley has also furnished some good suggestions for our guidance in hybridizing. All the sorts of Frontignan grapes are proper to add flavour to other kinds: but there is a superior richness in the Black, Blue, and Red Frontignans; and they do not partake so much of the strong Muscat flavour as the White and Grizzly do. But it must be considered, that the Blue Frontignan grows close upon the bunch, and therefore is only proper to be coupled with the loose growing kinds, that have long footstalks. The White Muscat of Alexandria produces large loose-growing bunches, and the berries being very large and well flavoured, it must be a proper kind to be coupled with many sorts. There is a peculiar delicacy in the flesh of the White Sweetwater; it is also a remarkably thin-skinned grape, with large berries; consequently, it is a proper kind to couple with various sorts that are small and less delicate. Were the Red Frontignan and White Sweetwater wedded together, their union would probably produce a very valuable sort, as there would be a good chance of its being both large and delicate, and well flavoured. The Syrian vine is only admired for producing most astonishingly large bunches, and, therefore, we would not advise the joining this coarse sort to any other except the following, as, in all likelihood, the offspring would only produce bunches much less ponderous. But the White Muscat of Alexandria, having large berries and longer footstalks, there would be a probability of producing a kind between this and the Syrian grape, that would exceed the original parents both in size and flavour. The Black Damascus and Grizzly Frontignan might be crossed; the flame-coloured Tokay and Red Frontignan, the White Muscat of Alexandria, and White Sweetwater; the Black Frontignan and White Muscadine, the St. Peter's grape and White Muscat of Alexandria. *(Speechley's Treat. on Vine, 55.)*

Layering. To do this in accordance with the definition of the term, take the branch of a vine of the last year's growth, long enough to reach under the surface, remove the soil to a depth of three inches, bend and pin down the shoot so as to confine two eyes under the soil. This is easiest done by a hooked stick, about a foot long, to thrust into the ground. The last eye, before it reaches the ground, should be cut away, so as to prevent its growing, and the eye next above the soil beyond where it is pegged down is depended on for the shoot that is to make the plant, and all beyond it should be cut away, as in this sketch.



But the objection to this practice is, the disturbance of the soil to get up the plant after it is struck, because the roots entangle with those of the parent vine. To obviate this, a pot may be sunk two or three inches below tbe surface, and the vine be pegged down, so that both eyes are compelled to strike into the pot. Separate the plant from the parent at the end of August, and plant it where it is to remain, without breaking the ball or disturbing the root. In this case the plant keeps growing, and must be fastened to the wall, or to a stake or espalier frame, as the case may be, and must be kept moist with liquid manure, from the time it is planted out till the leaves all but fall. (*Gardener and Flor*. iii. 7.)

It is not often that a desirable branch grows so close to the ground as to be layered in the above mode, and if the branch to be thus propagated from be higher up the wall, *circumposition* must be adopted.

In the first part of March cut away the fourth bud of the shoot to be layered, pass the shoot through the hole in the bottom of a garden-pot, fill this with light rich earth, so that the wound of that fourth bud is in the centre of the earth, and two buds above its surface; fix the pot firmly to the wall, so as not to be disturbed; keep the earth *constantly* moist with liquid manure, giving a little every day, and a little moss tied over the surface and round the sides of the pot to check evaporation. Cut away the layer from the parent in the last week of August; and, turning it out from the pot, *without at all disturbing the earth*, plant it where it is to remain, and water it plentifully with liquid manure until the leaves begin to fall. *(Johnson's Mod. Gard. Dict.* 287.)

Mr. W. Green, of Stepney, gives these further directions relative to this mode of propagation.

Make a layer in a pot, six inches in diameter (No. 32), any time before June ; for, if layered ever so early in the spring, it will make no roots before the middle of July. It is not necessary to ring, pierce, twist, or tongue the shoot before layering, as it will put forth roots without any operation of this kind; only requiring to be well supplied with water. Separate the layer from the stool in the last week in August ; plant it immediately where intended to remain ; keep it well supplied with water dnring the remainder of the autumn, and it will make shoots a yard long before the winter sets in. Shorten the young plant to one or two eyes, and it will shoot strong and fine in the succeeding spring.

If suffered to remain on the old stool after the last week in August, it will be found to have less and less roots every time it is examined, for they die off, and, when not planted before the spring, the plant will have scarcely any root left alive. *(Gard. Mag.* iii. 24).

Speechley, Hitt, and some other gardeners less worthy of attention, consider that vines raised from layers are less vigorous and enduring than others raised from cuttings, but we believe this opinion arose from their not separating the layer from the parent sufficiently early after it had once rooted, and from too much stem being allowed to remain after the separation. Dr. Neill, Loudon, and others of equal credit, fortified too by modern experience, consider layering quite equal to that by cuttings as a mode of propagation. Under certain circumstances, where the rooting is promoted by artificial heat, it is preferably used, as is thus pointed out from the practice of Mr. Macdonald, head gardener at Dalkeith House.

In the end of June or beginning of July, when the vines have made new shoots from ten to twelve feet long, and about the time of the fruit setting, he selects any supernumerary shoots, and bends them down so as to make them form a double or flexure in a pot filled with earth, generally a mixture of loam and vegetable mould; taking care to make a portion of last year's wood, containing a joint, pass into the soil in the pot. The earth is kept in a wet state; and at the same time a moist warm air is maintained in the house. In about a week or ten days, roots are found to have proceeded plentifully from the joint of last year's wood. The layer may now be safely detached. A layer cut off in the beginning of July generally attains, by the end of October, the length of fifteen or twenty feet. A new grape-house, therefore, might in this way be as completely furnished with plants in three months, as by the usual method in three years. Supposing the layers to be made on the 1st of July, they might be cut and removed to the new house on the 9th: by the 9th of October, the roof would be completely covered with shoots, and next season the house would yield a full crop of grapes. It is not meant that they should be allowed to do so, if permanently bearing plants be wished for; on the contrary, they should be suffered to carry only a very moderate crop, as it is pretty evident that the roots could not sustain the demand of a full one, or, at any rate, that the plants would necessarily show their exhausted state, by barrenness in the following season. By this means the more delicate kinds, as the Frontignan, may be quickly propagated; we have seen layers of the Gibraltar or Red Hamburgh, made in the beginning of July, reach the length of thirteen feet before the end of the month, yielding at the same time two or three bunches of grapes. The more hardy, such as the White Muscadine, form still stronger plants in that space of time. Little difficulty is experienced in removing the plants from the pots into the holes prepared for them: if there be fears of preserving a ball of earth to the new roots, the pots may be sunk with them, and then broken and removed; or the plants may be kept in the pots till autumn, when they may very easily be taken out of them without detriment. (*Dr Neill, in Edin. Encyclop.*)

By eyes, buds, or joints.—This mode of propagation, first suggested by the Rev. Mr. Mitchell, of Thornhill, in 1777, is preferred, because the sets are more easily managed in pots than longer cuttings, and than layers, because the latter require more attention in keeping the soil moist, and in reducing the leaves so that they do not demand a greater supply of nourishment than the young roots can supply.

The bud to be planted may be done so with all its wood remaining, but the rooting is found to be facilitated by slicing away, from its entire length, about two-thirds of the wood and pith, thus :—

Mr. Speechly, gardener at the Fence, near Macclesfield, gives the following directions for this mode of propagation.

At the pruning season, having selected some well-ripened, short-jointed cuttings, keep them planted in the earth until February, or early March, and then cut each bud with about half an inch of wood on each side of it, and insert it in a pot four inches in diameter, filled with light rich soil, covering the bud half an inch, and pressing the earth firmly about it, plunge the pots in a bark bed, or dung bed covered with tan dust: either of these will do, provided the heat is moderate. It will soon shoot up above the soil, and begin to send out roots; water very sparingly for a time, increasing the quantity as required. Air is given on all mild days to make the shoot become stout and of a good colour. As soon as the roots reach the sides of the pots, shift into larger, which operation may be done thrice during the growing season; the shoot will require a stick to support it, and all the superfluous leaves and tendrils removed; ripen the wood by keeping as dry an atmosphere in the pit or frame as possible, during the latter part of the season, endeavouring to effect this without any reduction of temperature, which should average about 70 degrees Fahrenheit. When the wood is sufficiently ripened, keep the plants in a cool house, or frame, just protected from frost until the planting season.—(*Gard. Chron.*)

Dr. Lindley and Mr. Robertson have added some further suggestions which deserve especial attention.

The eyes from which it is intended to raise vines should be large, and taken from the best ripened short-jointed shoots; whether from the open wall or from under glass is immaterial. They should be grown in rich compost, singly, in small-sized pots at first, and successively shifted into larger as the roots increase. They must be kept in bottom-heat of dung or tan, and trained near the glass. As much circu-

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The bud to be planted may be done so with all its wood pertaining, but the rooting is found to be facilitated by slicing away, from its entire length, about two-thirds of the wood and pith, thus :—

Mr. Appleby, gardener at the Fence, near Macclesfield, gives the following directions for this mode of propagation.

At the pruning season, having selected some well-ripened, plump-budded cuttings, keep them planted in the earth until February, or early March, and then cut each bud with about half an inch of wood on each side of it, and insert it in a pot four inches in diameter, filled with light rich soil, covering the bud half an inch, and pressing the earth firmly about it, place the pots in a bark bed, or dung bed covered with saw dust; either of these will do, provided the heat is moderate. It will soon shoot up above the soil, and begin to send out roots; water very sparingly for a time, increasing the quantity as required. Air is given on all mild days to make the shoot become stout and of a good colour. As soon as the roots reach the sides of the pots, shift into larger, which operation may be done thrice during the growing season; the shoot will require a stick to support it, and all the superfluous leaves and tendrils removed; ripen the wood by keeping as dry an atmosphere in the pit or frame as possible, during the latter part of the season, endeavouring to effect this without any reduction of temperature, which should average about 70 degrees Fahrenheit. When the wood is sufficiently ripened, keep the plants in a cool house, or frame, just protected from frost until the planting season.—(*Gard. Chron.*)

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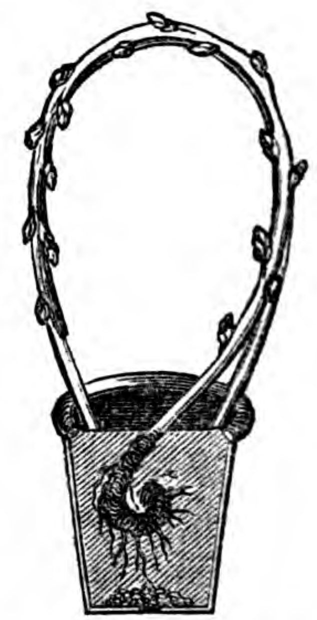
Mr. Robertson, gardener to the Marquis of Waterford, chooses buds from vines that for several years previously were started in December; this he considers an important point, as the young vine inherits, to a great extent, the habit of the parent, and is consequently better adapted for starting at so early a period. He plants each bud singly in a five-inch pot, well drained and filled with leaf mould and loam; the pots are plunged in a bottom-heat of from 80 to 90 degrees, with a top heat of from 60 to 65 degrees, till they begin to grow, when the top heat is raised to 70 degrees; when the roots reach the sides of the pots, the plants are shifted into nine-inch pots, using the same soil, and top and bottom heat for a week, when the top heat is raised to 75 degrees, with a moist atmosphere, watering with clear liquid manure once a fortnight.—(*United Gard. Journ.* 1846, 168.)

By Cuttings.—Whether short or long cuttings be employed for propagating the vine, Mr. Shortland, of Tring, is quite right in directing the gardener to make choice of such shoots as are upon the most productive part of the vine, otherwise the plants they form will partake of the bad qualities of the parent, for a person may collect either fruitful or unfruitful cuttings from the same plant; as an instance, if we raise plants from a strong shoot, with the cellular texture of a dark colour, the young plants will retain this appearance. (*United Gard. Journ.* 1846, 185). Make the selection at the time of autumn-pruning, and let them be middle-sized, well-ripened shoots. For short cuttings, cut off lengths of six buds, keep them in moist sand through the winter, and, at the end of March, cut them in half, remove the two lower buds, and plant them under a wall having an eastern aspect, leaving the upper bud just above the surface, and covering them with a hand-glass. The soil must be light, rich, and well pulverized, pressed close round the cuttings, and *kept constantly moist* with liquid manure until the leaves fall in autumn. The surface round them should be well stirred at least three times a week to allow the air a free entrance.

Cuttings should be chosen from those shoots which have the shortest joints, always having one or two joints of the last year's wood, cutting it perfectly smooth and a little rounding at the lower end, and as near to a joint of the old wood as possible. The eye or bud should be large, prominent, and bold. The shoots should be moderately strong, round, and short-jointed. The texture of the wood should be close, solid, and compact; but the best criterion is its solidity, and having very little pith. Cut the upper end smooth and sloping towards the wall; or, if in beds or borders, let the cut always face the north. Against piers or walls, set them at about a foot distance, and so deep as to have the second eye level with the ground; remembering always to rub off the lower eye. Pick off all runners and side shoots, leaving only two shoots, which should be trained at their full length. In January or February they may be pruned, leaving one or two eyes on each, according to the strength of the shoot. In the first year, especially if the summer be dry, and they have not been duly watered, they will make little progress; but in the second year it will be plainly discerned which are the strongest plants.

Long cuttings, in the days of Miller and Speechley, were preferred, and are still employed on the continent. The shoots used are 18 inches long, with a small piece of the previous year's wood attached. They have their entire length, except the two upper buds, buried within the soil.

Coiling is only a peculiar mode of propagating by long cuttings suggested by Mr. Meárns, whose practice has been epitomised thus by Dr. Lindley:—In the propagation of vines by coiling, Mr. Mearn's practice, if single rods are contemplated, is not to leave them longer than four or five feet, and to remove all the buds but the uppermost. These rootless cuttings are coiled into long narrow pots, being so placed that the bud of the apex of the shoot, although the highest part, is still two inches beneath the surface of the soil; at the same time sufficient room is left beneath the coil for the roots to extend themselves. These cuttings being put in between the middle of January and the end of March, are plunged at once into a hotbed between 90 and 100 degs., where they remain until they require more pot-room. They are then shifted, and placed in a suitable situation until again excited in November or December. When the cutting begins to grow the shoot is trained upright, until it is seven or eight or ten joints long, when the top is pinched off. After this stopping, the laterals are displaced as they appear; and if the vines have done well, two or three of the buds will also be excited at the same time, in which case the shoots are cut down to the lowest excited eye. The single shoot is then trained upright, and divested of all laterals and tendrils. None of the plants are allowed to grow longer than from four to six feet, at which length the tops are pinched off, the uppermost lateral, which is also stopped at the first joint, being left to carry off the remaining sap. At this season, the plants are removed to a warm and sheltered situation in the open air; and when the leaves fall they are headed down to one, two, or three joints, according to their strength, and are placed against a northern aspect. When cold weather sets in they are taken back to a sheltered spot, and plunged in the ground to protect the roots, the pots being mulched over, and the rods covered to protect them from frost. When these yearling potted vines are brought early into action, it is recommended to bow a piece of wire above the pot with both its ends running down the inside, of sufficient height to allow the whole length of the stem to be attached to it, as represented in the accompanying figure. The buds from the stem, being thus bent, break more regularly;



and when this is effected the vine is united, and secured to an upright stake or sloping trellis. To prevent evaporation the stem is wrapped loosely in moss, kept constantly moist until the grapes are set, when it is removed. The plants, up to this period, are encouraged by bottom-heat and shifting; and the quantity of fruit is regulated by the size of the pot and the quality of the vine.—(*Gard. Chron.*)

Grafting the vine is practised, either whenever the greatest number possible of plants are required to be raised at once from the parent, or when it is desired to render a weak variety stronger by inserting the scion on a more robust stock. It cannot be practised except when the vines are in leaf. At any other time the bleeding prevents a union between the stock and scion. By the time the leaves are fully expanded the glut of sap is over, and the bleeding has ceased. In fact, the leaves have partially emptied the tissue of the excess of fluid.—(*Ibid.* 1843. 881.)

Grafting the vine, so long as only the year-old portions of shoots were employed, was always a very precarious operation, but the sagacity of the late Mr. Knight has rendered it as certain of success as with any other tree.

It is well known that the ancients, in propagating the vine, employed cuttings, which consisted partly of year-old, and partly of two-year old wood; and the modern gardener, in deviating from this mode of practice, has adopted one which does not possess a single advantage, and which is, in every respect, worse. Mr. Knight says, that he, therefore, conceived it probable, that the success of the Roman cultivators

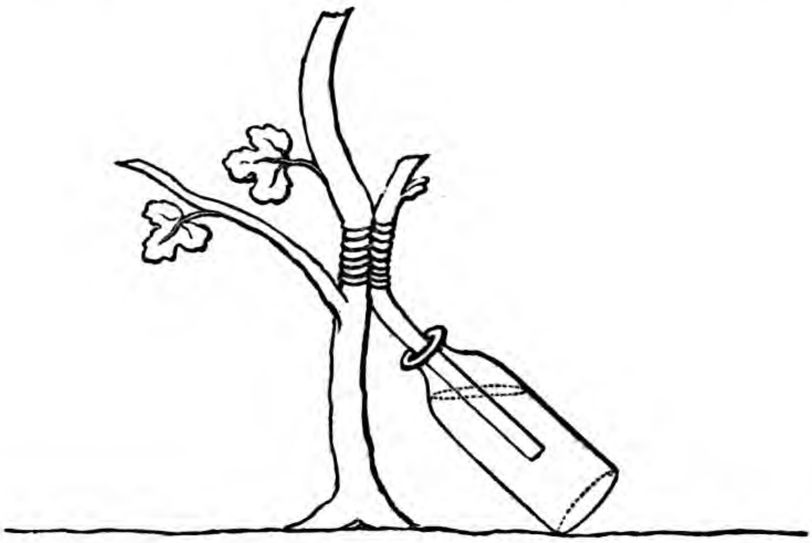
in grafting their vines might have arisen fr
selecting grafts similar to their cuttings;
result of experiment shews his conjecture to
founded. He selected three cuttings of tl
Hamburgh grape, each having at its base on
two-years old wood. These were inserte
rather fitted to, branches of nearly the same
of greater age, and all succeeded most perfe
clay which surrounded the base of the g
kept constantly moist; and the moisture
plied to the graft operated very beneficially
it was not essential to the success of the c
A very skilful gardener was completely succ
a somewhat different method. He used gr
lar to Mr. Knight's; but his vine grew u
roof of the hot-house, in which situation he
difficult to attach such a quantity of clay
supply the requisite degree of moisture to t
and he therefore supported a pot under ea
upon which he raised the mould in heaps su
high to cover the grafts, and supply them w
ture. The grafts which Mr. Knight used
of about two inches of old wood, and five
wood, by which means the junction of the
old wood, at which point cuttings most rea
shoots and receive nutriment, was placed clo
head of the stock, and a single bud only was
to vegetate.—(*Knight's Papers*, 258.)

Mr. Braddick, about the same time, observed that the stocks of vines when grafted in the usual way bled profusely ; it, therefore, occurred to him that the proper time for grafting them, without incurring any danger of their suffering from bleeding, would be when they had reached that period of their annual growth at which the sap ceases to flow thinly and rapidly. He accordingly cut the branches of several in that state, and whip-grafted them with cuttings of the preceding year, binding the joints up with bast, and surrounding the latter with grafting clay. The whole of them grew, and he was thence led to conclude that healthy vines might be successfully grafted with young wood of the preceding year's growth, from the time that the shoots of the stocks upon which the grafts are to be placed have made four or five eyes, until midsummer. Mr. Braddick also found that vines, out of doors, might be grafted with shoots of the same summer's growth, worked into the rind of the young wood, from the time that young bunches of grapes became visible upon the stocks until July ; while those under glass might be grafted a month later. In neither case, however, should the operation be deferred after the periods mentioned, on account of the time required for ripening the grafts before winter.

Chaptal, in his treatise on the culture of the vine, states that the following mode of grafting is practised in the vineyards of France, to replace those stocks which die from age or other unforeseen accidents :—

Having selected a healthy stock, it is, just when the sap is beginning to flow, taken off with a clean cut an inch or two below the surface of the ground. The upper portion of the stock, which must be perfectly free from knots, is split evenly down the centre and pared quite smooth within, of a sufficient size for the reception of the scion. The latter is pruned to three eyes in length, having the lower part cut in the form of a wedge, commencing about an inch beneath the lowest eye, and gradually tapering to the bottom. It is then inserted as far as the lowest bud into the cleft in the stock; the second bud is level with the surface of the ground, which is drawn close around it, and the uppermost is quite above the soil. Great care is necessary in adjusting the scion, that its bark may touch that of the stock in every possible point. The whole is then bound round with a pliable osier, which retains the scion in its proper place. The best season for grafting the vine is just when the warmth of spring sets the sap in motion, and it should be performed when the sky is cloudy, with the wind blowing from the south-east or south-west. Whenever a northerly wind or great drought prevails, it is better to delay the operation; a burning sun or cold wind would arrest the course of the sap by drying up the vessels at the point of union. Neither is it advisable to graft in rainy weather, because the water will trickle down into the incision, and prevent the union between scion and stock. The best time for taking off the grafts is in a dry day towards the end of autumn, when the sap is still. They should be cut off with a portion of the old wood adhering, which will assist in preserving them until wanted for use. They should be plunged two or three inches deep in damp sand, and kept in a cool cellar, where neither heat nor frost can penetrate. Twenty-four hours previously to being used, they should be taken up, and that part which had before been in the sand should be laid in water. Chaptal, moreover, states, that the vine is thus grafted with so much facility, and the union between scion and stock is so perfect, that no plant appears more adapted for this mode of propagation.—(*Gard. Chron.* 1843, 208.)

A graft of last year's wood is spliced by the middle, with or without a tongue, after the manner of inarching, to similar wood of nearly the same size, upon a healthy plant, and is afterwards bound up and clayed over. One bud is left above the clay, beneath which the lower part of the graft hangs at full length, so that the end may be plunged into a bottle of water in which the roots will be thrown out. The stock should be in leaf, with shoots six or eight inches long, and the graft must have been carefully kept, so as to have good swelling buds at that time. The growth of the grafted portion of the stock should be encouraged until the graft seems to have taken, when the latter must be favoured. The whole tree may fruit as



usual, but it should be pruned to the graft in the autumn; the next year it will make bearing-wood of great length. The proposer of this mode prefers the green wood for grafting, provided the desired sorts have not to be brought from any great distance, and practised with the bottle, &c. in the same way as the last. This succeeds best about June, when the young shoots will cut firm. In this case several buds and leaves should be left about the clay. He had many in bearing on both methods in a cool vinery; but had not tried either mode out-of-doors. (*Ibid.* 1843, 231.)

Mr. Speechley's directions are still deserving of every attention on this subject. He says, at the pruning season, make choice of cuttings for grafts, or scions, from the best bearing branches of the sorts intended to be propagated. These cuttings should be preserved in pots filled with light sandy earth till the grafting season.

Upon small stocks, not more than an inch in diameter, cleft-grafting is most proper; but upon larger stocks, whip-grafting is to be preferred. In both methods care should be taken in fitting the stock and scion together, and the operation should be performed with great exactness. Though the scion will sometimes begin to push in a few weeks, yet it will frequently remain dormant two or three months: during this period the stock must be stripped of all its shoots, as soon as they appear; and to preserve the scion in a vegetative state, the clay must be kept moderately moist, by wrapping wet moss round it, and by keeping the moss constantly sprinkled with water. When the scion has made shoots five or six inches long, the clay and bandage should be carefully taken off.

The most important advantages of grafting are, first, that if a wall should have been planted with bad kinds of vines, instead of stubbing them up, and making a new border, by which several years must elapse before the wall can again be completely filled: by grafting, the nature of the vines may be changed immediately, for good grapes may be obtained from the same year's graft; and in a hothouse the grafts, if permitted, will frequently shoot thirty or forty feet the first summer. Secondly, in small vineries, or vine-frames, where any great variety could not be had in the common way, it may be procured by grafting different kinds upon the same plant. Thus, a Syrian vine, in the hot-house at Welbeck, produced sixteen different sorts of grapes in Speechley's time, but the principal advantage of grafting, is the improvement of the various kinds, and particularly the small ones, which generally make weak wood. This may be done by grafting the weak and delicate-growing vines upon the stocks of those which are more robust and vigorous. Thus, the small Blue Frontignan, engrafted on the Syrian vine, produces well-sized handsome bunches, with berries almost as large as those of the Black Hamburgh.

The best method of grafting vines is to shorten the branch or shoot at the winter pruning to the most eligible place for inserting the graft. The graft should be kept in sufficient moist soil till the time of performing the operation, and for a week previously in the same temperature as that in which the vines to be operated upon are growing. When such portions of the latter as are shortened for receiving the grafts have made a small shoot, graft as you would other fruit-trees, taking care, however, to preserve the shoot at the top in claying, and until the buds on the scion have pushed, then shorten it back. (*Ibid.* 1843, 744.)

If the stock is not cut down in the autumn as above directed, then, in the spring, cut off the stock below the surface of the earth, after the leaves are fully expanded, and all danger of bleeding is past. Split the stock as in cleft-grafting. Insert the scion, bearing two or three buds, having first cut the end to be inserted in a wedge-like shape; bind up the place of insertion lightly; draw the earth up around the whole, leaving the bud mainly depended upon, usually the second from the top, just even with the surface. The after-management consists in taking off the shoots that rise from the stock, those that spring from the scion, all but one, and training that up carefully as it grows. Put the scion on one side of the stock, and to insure success, when the stock is sufficiently large, insert two scions, one on each side of the cleft.—(*Hovey's Mag. of Hort.* Oct. 1843.)

When the stock is only the branch of another vine, or even if the stock be devoted to the scion, grafting is usually performed as thus directed by Mr. Gowan. Select a scion with one eye, and cut it in the form of a wedge. For a stock, select a shoot of the preceding year, about the same thickness as the scion, and cut it over a little above the second eye from the old wood. With a sharp knife cut it down the centre nearly to the old wood. Out of that half of the stock which is opposite to the eye or bud, pare with a penknife as much as is necessary to make it fit the cutting on the sides of the scion. Insert the scion with its eye opposite to that left on the side of the stock. Tie it up, and clay it over in the usual manner, with this difference, that you cover nearly the whole of the scion with the clay, leaving only a small hole for its eye. Tie a little moss over the clay, upon which sprinkle a little water occasionally, to keep the whole in a moist state for some time. It is of essential importance to success in this method, to leave the eye or young shoot on the top of the stock, and allow it to grow for a few days, when it should be cut off, leaving only one eye, and one leaf to draw sap to the scion, till it be fairly united to the stock. (*Gard. Gazette.*)

Stocks.—The Syrian, the Chasselas d'Arboyce, the Isabella, and the Black Hamburgh, make the best stocks, being all robust growers, but especially the two first-named. Frontignans are so improved in size by grafting on these stocks, as scarcely to be recognised by the eye.

As a matter of curiosity it may be observed that, by grafting, the late Mr. Knight succeeded in substituting the leaf stalk, the fruit stalk, and the tendril of the vine, in many instances, for each other; but that he failed in efforts to engraft a bunch of grapes, by approach, on the leaf-stalk, owing to the operation having been improperly performed. In those experiments he cut the leaf-stalk into the form of a wedge, and made an incision in the fruit-stalk adapted to receive it; but, under such circumstances, the leaf-stalk has no power to generate new matter, and the wounds of the fruit-stalk heal so slowly that the ill success of the operation was anticipated. He then pared off similar portions of the leaf-stalk and fruit-stalk, and bringing the wounded parts into contact, secured them closely together by means of a bandage, letting the leaf remain. Under these circumstances a union took place; and the fruit-stalk being then taken off below the point of junction, and the leaf-stalk above it, the grapes drew their whole nutriment through the remaining part of the leaf-stalk. They did not, however, acquire their full size; and the seeds were small, and it was thought incapable of vegetating; but this Mr. Knight attributed to the want of nutriment in quantity rather than in quality; for the union of the vessels of the leaf-stalk, with those of the fruit-stalk, was very imperfect. The grapes, which were the purple Frontignan, possessed their musky flavour in the same degree with others growing on the same plant. (*Knight's Papers*, 108.)

Budding.—Bud about the first week in March, or as soon as the sap begins to rise. Cut an eye about three inches in length, having attached as much wood as you can get with it; at each end of the eye cut off about a quarter of an inch of the upper bark, making the ends quite thin. Next, measure off the exact length of the bud on the bark of the vine intended to be budded, and make a nich slanting upward at the upper part; and another slanting downward at the bottom. Then take the piece neatly out, so that the bud may fit nicely in, and by making the nich as stated above, each end of the bud is covered by the bark of the shoot. Bind the bud firmly round with matting, and clay it, taking care, however, that the clay does not cover the eye of the bud. Then tie it round with moss, and keep it constantly damp, and as the sap rises in the vine the bud begins to swell. When the vine commences to push out young shoots, take the top ones off, in order to throw a little more sap into the bud, and as you perceive it getting stronger take off more young shoots, and so continue until you have taken off all the young shoots. Budding can only be performed where the long rod system is practised, as in that case you have the power of confining the sap to the bud, which will grow vigorously. As soon as you perceive this, cut the vine down to the bud. Budding has the advantage over grafting of not leaving an unsightly appearance where the bud was inserted. A bud likewise grows more luxuriantly. Allow the matting to remain until about the month of September. (*Gard. Chron.* 1844, 870.)

SOIL AND MANURES.

No tree cultivated by the gardener requires more attention to the soil in which it is grown than does the vine. It must be light, rich in slowly decomposing organic matters, and thoroughly drained.

In taking into consideration this division of the subject, we would premise, that the mechanical texture of soils, as it is termed, is a question of greater importance than even that of manures.

For although, as is well known, the vine is what is termed a "gross feeder;" yet, no kind of manure will long avail, if the soil is allowed to become stagnant through the retention of water, and of course the exclusion of the atmosphere.

The vine has been known to grow, and even thrive, almost entirely in broken bricks; indeed Mr. Clement Hoare advises a compost of bricks, charcoal, mortar, and crushed bones, to the exclusion of soil; and although such has proved, in the main, a failure, it has at least pointed to the necessity for the soil being porous.

A soil properly constituted for the vine, will receive, equalise, and transmit moisture with rapidity; whether it be rain, dews, or artificial watering. It will, as a consequence, be at all times in a state fitted to receive the vivifying influence of the atmosphere; and that the vine is partial to such agencies, is pretty well at-tested, by the well-known readiness with which the stems of even aged vines will emit roots, when the atmosphere is sufficiently charged with humidity.

It will be found that all our best practical gardeners, from Speechley to this day, have concurred in recommending loamy soil, and the chief component part of the compost. Loams are more certain and steady in their action than vegetable matter or manures; they, moreover, contain certain inorganic materials, which, it appears, cannot well be dispensed with.

The selection of loam, then, becomes a matter of some importance; for, with regard to horticultural purposes, there is much difference, both as regards texture and quality.

For general purposes, however, three distinct classes may be noticed—as a clayey loam, or one in which the clayey principle predominates; a sandy loam, or one in which the clayey principle can scarcely be detected by ordinary means; and a mellow loam, as it is often termed: this last is as near as possible intermediate, and is by far the best for the vine. If, however, it cannot be obtained, it only remains to mix the other two, in such proportions as may be necessary, in order to imitate its texture.

If such can be obtained from very old lays, with a thick sward, it is invaluable; and if severe economy in its use is necessary, a considerable proportion of any ordinary soil may be used with it, especially if containing some fibrous or vegetable matter.

The best of all localities for the vine, whether to be cultivated on the open wall or under glass, has been thus correctly pointed out by Mr. Barnes, gardener, at Bicton Gardens, near Sidmouth :—

An elevated situation, inclining with a considerable angle towards the south or south-east, well sheltered, and consisting of a free, or rather sandy loam, resting on a subsoil of coarse sand, or dry rock, would not be a very inferior situation as regards natural advantages ; because it would require nothing more than to be moderately trenched, and to have added a moderate supply of any favourite manure that may be most readily obtained, such as charcoal and brick rubbish, of which there would be no fear of using too much. It is easy to see with what economy such a situation could be effectually and permanently drained. If such a situation be chosen with all the above natural advantages, except the soil, and this requires to be improved, trench it moderately, if it would allow of such an operation ; breaking through the sub-soil, in order to obtain a free circulation both of air and water. Then place a quantity of bricks, stones, wood, charcoal, &c., on the natural surface, and above these, whatever depth of border is intended. The border, in the case of a stove, could, in the first instance, be made only inside of the structure, where, of course, it would be of great advantage always to plant the vines ; and the structure should always be built on arches, formed entirely above the natural surface, and not excavated ; for when this is done, it is not easy to obtain efficient drainage, and the natural soakage of the surrounding land also drains into the border. (*United Gard. Journ.* 1845, 476.)

The avoidance of stagnant excessive moisture, as we have already observed, is, indeed, of paramount importance, and Mr. Marnock, the judicious curator of the Botanic Garden, Regent's Park, does not speak too strongly in saying that proper drainage ought to be regarded as the first essential in making a vine border. We greatly doubt, as he does, the propriety of making impervious bottoms. Deep drains, completely surrounding the vinery and the border, being at least four or five feet below the bottom of the prepared soil, and filled with stones, broken bricks, or some similar material sufficiently permanent and open to allow the water to filter from the border and the surrounding ground, and forming a complete and thorough drainage, is of infinitely more importance than all the other considerations put together. In a wet or damp border no care can prevent the decay of the young and tender roots in winter. A valid objection to paved and impervious bottoms arises from the fact, that Mr. Marnock, and others, say they made such borders, and upon examination in winter, found that the moisture could not escape through this bottom, and that the under part of the border was completely saturated, and in a state more like thick puddle than compost, for the safe preservation of the young and dormant roots of grape vines. In the instance quoted by Mr. Marnock, the bottom of the border sloped rapidly to the front, but this was insufficient; the wet which passed from the surface was intercepted in its progress downwards by the impervious bottom, and before it could escape into the drain, it had to pass through the soil from the front of the vinery to the opposite sides of the border, a practical evil of the very worst kind. If to a considerable depth the border were rendered quite free from superfluous moisture by thorough draining, and carefully cultivated by frequent shallow stirring of the surface, it would scarcely seem possible that there should be any danger to apprehend from the roots descending to too great a depth in the soil. (*Unit. Gard. Journ.* 1845, 233.)

These directions seem to contain nearly all the essentials necessary to ensure success for a vineyard. A subsoil of gravel, however, in addition, would, no doubt, be excellent, providing there was a foot of free sandy loam resting on it.

This would require, in general, neither subsoiling nor drainage. If, however, surface springs exist, it would be necessary to cut them off, or intercept them by means of preventive drains. With regard to depth of soil, we consider from one foot to 15 inches better than a greater depth, whem combined with a system of top dressing. It must never be forgotten in this matter, that deep soils are essentially antagonistic to the principle of ripening the wood, which should, by all means, form the basis of the whole culture. Deep rooting implies late action of root, and this has ever proved inimical to success in the vine, the peach, the apricot, and other fruit trees, the natives of warmer climes and brighter skies than those of Britain. There is no necessity for making concrete, or other impervious bottoms: we consider it labour wasted, for such must, in some degree, prevent the free ascent of underground warmth, as well as the ready transmission of moisture.

As to frequent stirring of the border, it would appear from facts, that it is a somewhat doubtful process at the best; more especially in shallow soils, which are rightly constituted, these are sufficiently pervious to the atmosphere in their own nature, for any given length of time. We would say, depend on a regular system of top dressing, at proper intervals—such being ruled by the amount of energy in the plant. If the soil is very shallow, the top dressing should not consist of manures alone, but a mixture of soil with them; soils for this purpose would be readily procured in lowering the headlands of fields, in fact almost any free soil would be suitable. In forming the soil for a vineyard, if the requisite substratum did not exist, the most economical mode of procedure would be to form stations under the centre of each vine, of about four or five feet square; this would be amply sufficient. Bricks or stones, of any kind, would be eligible—rough broken; and covered with cinders, coke, or small gravel.

We quite agree, in the objection to concrete or other impervious flooring for vine borders, but the roots should be equally prevented striking deep, by having the foundation made of either chalk or brick-bats, or other infertile matter, to the depth of about two feet, so that there is a perfect passage for wet, and the roots are repulsed at the same time by the sterility of this substratum. The following are the directions for preparing vine borders, given by some of our best modern authorities:—

The soil most suitable for a vine border is the surface-spit from a field of an old fertile loam pasture; this should be collected for some time before it is required, mixed with a good proportion of cow-dung, and the whole turned over at intervals, three or four times, and exposed to the action of the weather. In preparing the border, the old earth should be cleared away from the whole space, to the depth of about 2½ feet, and a main drain cut parallel with the length of the border, at its extreme outer edge. This should be at least two feet lower than the bottom of the border, whether laid with concrete, chalk, or bricks, and the bottom of the border should have a gentle inclination from the back to the drain. To render this drainage more effectual, cut small drains, placing drain tiles at their bottoms, at convenient distances, to run in a slanting direction from the back of the border into the main drain, the latter being six inches below them. A few turves should be laid over the tile drains, with the grassy sides down; the fresh soil may then be filled in, taking care to keep the roughest part nearest the bottom. (*Gard. Chron.* 1843, 825—*United Gard. Journ.* 1845, 219.)

Three cubic yards of compost are enough for each vine; this will admit of the border being ten feet wide, or, with forty-eight cubic feet, you may form it only six feet wide in the first instance, and add six feet more as the vine roots extend. (*Ibid.* 1844, 720.)

We concur for the most part in the above directions.

Whatever depth of border may be adopted, the sub-stratum should bid defiance to excess of moisture. This being secured, the next point is compost: chopped turf of a loamy character, and inclined to what is termed "sandy loam," is complete, or nearly so, in itself for this purpose, providing the previous points be efficiently secured. As, however, soils, as well as subsoils, differ so much in point of mechanical texture, it is perhaps wise to use a mixture which, in point of texture, may bid defiance to all weathers. Two-thirds, then, of the loam above described, with the other third composed of equal parts of charred brushwood, old plaster, and what is termed by agriculturists "half-inch bone" (boiled bone), will be found all that can be desired, or nearly so, in border-making. The loamy turf should be from very old pasture land, the older the better; if this is not obtainable, then get it from an old lane or road-side: merely quarter it with the spade, and by no means either cut or handle it in any way when wet; dryness is as indispensable a point in the handling the material for a vine border as for harvesting. The loamy turf should be thrown in alternate layers with the other portions of the materials, well blended together, and close at hand. Some raw stable manure, chiefly droppings, should be strewed in thin and regular layers, all through the mass. Before, however, filling in the above compost, which should be two feet in depth, place a layer of half-charred brushwood, of some strength, over the drainage and substratum; this layer should be nearly a foot in depth. (*Hort. Soc. Journ.* i. 50.)

Mr. J. Roberts, gardener at Rowton Castle, gives the following formula for making the soil for vine borders:—Turf taken from about two acres of very rich pasture; lay this in a heap, with 25 loads of brick-kiln dust, 60 loads of well-decayed manure from the stable-yard, 50 loads of good maiden soil, 20 loads of scrapings of the road, 25 loads of lime rubbish, 15 loads of the settlings of a pool which contained manure-water, and 10 loads of the scrapings of a farm yard. Mix these well; let them lie one summer and the whole being turned roughly over at the beginning of the winter, it will be in a good state for use. (*Unit. Gard. Journ.* 1845, 394.)

Width and depth of borders.—Next in importance to thoroughly securing the roots of the vine from excessive wet is planting them shallow, and taking care that the roots shall keep near the surface, and have abundant space to pasture in. To secure these desiderata, the border should be ten or twelve feet wide, and the compost two feet deep, over the entire space. The greater width is that which we prefer.

Concrete.—As some gardeners may wish to try the consequences of making an impervious concrete bottom to their vine borders, we give the following recipe for its preparation :—

Forty bushels of powdered quicklime and 80 bushels of coarse sand and small pebbles, worked up with water to the consistence of thin mortar, will be sufficient for a border 50 feet by 12. The mixture should be worked till the lime is completely slaked, and immediately spread evenly where it is intended to set. (*Gard. Chron.* 1845, 876.)

Hoare's System.—This is a failure, and it is a subject for regret that one who had written so ably and practically on the wall-culture of the vine, should have reasoned so incorrectly, and launched forth such wild theories relative to the management of its roots. He is quite correct in his position that, as we depart northward from the native country of the vine, and the power of the sun, the warmth of the soil and the evaporation from it consequently diminish, and therefore much less moisture to the roots is required; but he is quite in error, and carries the inference to a most false extreme, when he adds, as a consequence, that "a collection of stones, or of similar substances, without any admixture of soil whatever, will prove the best border for the roots of vines in this country." In conformity with this opinion, he recommends a border to be made of soft bricks, lumps of old mortar, charcoal, and fresh bones; the three first broken into pieces the size of a hen's egg, and soaked in urine, and the bones either whole or in fragments. This rubbly mass, whether in a house or open border, he directs to be enclosed on all sides within solid brick-work—a system of all others the most objectionable for the open border, as it wonld form a kind of well, and prevent the escape of superfluous moisture, and needlessly confining the lateral extension of the roots. Carrying his theory to a still further unreasonable excess, Mr. Hoare recommends, for out-door cultivation, that the roots of the vines shall be made to grow *upwards* in hollow columns filled with the same rubbly materials. In our opinion, as these materials must be drier at the top of the pillar than at the bottom, the roots could never be induced to travel in a course diametrically opposed to the natural. But admitting the possibility of compelling the roots to mount upwards, we cannot perceive that such *boulversement* can be productive of any good that could not be secured by much more easily attained, and much more natural means. A thoroughly drained, justly-soiled border will always secure to the vine a more correct supply of food and moisture than a brick pillar filled with Mr. Hoare's rubbish. Again, the vine is to be trained about the column; in which case, how will the grapes ripen on the most shaded of its sides? We need not, however, dwell upon objections to a mode of planting which is opposed to all the suggestions of science, and which has signally failed in practice; nor should we have dwelt upon the subject so long, if it had not been recommended by Mr. Hoare, who is most deservedly a first authority upon the wall-culture of the vine. As some persons may wish to test this recommendation of Mr. Hoare, we will give an epitome of his directions for constructing one of his hollow columns, which he says is to be 5 feet high and 3 feet diameter, and built in any sheltered spot facing the course of the sun. Lay a course of bricks on the ground in the form of a four feet square, to form the base of the column. The joints of the brickwork to be filled in with cement or strong mortar, so as to prevent the roots of the vine from penetrating through into the soil beneath. The circle for the brickwork must then be accurately marked out; after which, the first course of bricks is to be laid flatwise, so that their inner ends may point to the centre of the circle, and their outer ones form the periphery of it. Half-bricks will be sufficiently strong, provided that at four equal distant parts of the circle, in every course, a whole brick be laid, which will strengthen the work and make it firm. Half-bricks, while the cost of them is much less, will not require so much cutting as whole ones; and they will also leave a greater space inside of the column for the reception of the materials. The first circular course being laid, the interior is to remain as it is, hollow. Mark the exact spot in this course where the shoot of the vine is to go through the brickwork, and this should be opposite the centre of one of the sides of the base, that faces either the south or east, or any intermediate point. The second course of bricks is then to be laid as before, observing that, as the shoot of the vine is to go through here, a semicircular hole is to be made in the upper surface of the brickwork, of an inch and a half in diameter, to form a passage for the shoot. The second course being laid, the hollow space is now to be filled with the rubbly materials as high as the surface of the brickwork. They must be put in by the hand, and placed closely and compactly together. Now plant the vine, which should be a strong plant, three years old. It is to be laid on its side, with its roots inside of the column, and its shoot passing through the semicircular hole to the outside of it. That part of the shoot that lies in the hole is to have all its buds cut out, leaving as much of the shoot outside the column as contains three good buds. The third course of bricks may then be laid, taking care that a brick with a semicircular hole, exactly the same size as the other, is laid over the brick on which the shoot of the vine is resting, and which will then be lying in a circular hole, an inch and a half in diameter. The third course being laid, the internal vacancy must be again filled up with more materials, taking particular care to place them close round the inner end of the hole containing the shoot of the vine. The hole on the outside, also, should be filled with moss, which will protect the roots during their first growth. The remaining courses of brickwork may now be laid in succession, and the materials filled in as the work proceeds. When the column is built up within three courses of its intended height, and the materials filled in exactly even with the brickwork, a course of whole bricks must be laid over the entire surface, taking care that those which rest on the materials are not to be laid on mortar, but merely jointed with it. This course being finished, the last two are so formed with whole bricks laid flush with the outside, and with their inner ends slightly sloping towards the centre of the column, which will cause all the rain that falls on them to run towards it, and fall into the sunken hollow space that will be there formed by this circular ring of brickwork. (*Hoare on Planting the Vine*, 67-73).

Manures.—Little is known in this country of the comparative value of manures, in the cultivation of the vine. Some able cultivators recommend horse manure, some prefer that of the cow. Others, again, prefer leaf soil ; and we may here add, that one of the healthiest black Hambro' vines ever seen, was growing entirely in half decomposed tan, in the corner of a pine stove, and trained over the back walk. It was, however, only of some five or six years' standing; whether it endured we cannot say. We have always found horse manure, mixed with leaves, everything that can be desired for a top dressing. With regard to the mixing of manures in the compost, other considerations should be allowed to influence the matter. In the first place, slow decay is a most essential point; and, on this account, we always mix fresh strawy horse droppings through the mass of soil. Bone manure is, however, after all, the most eligible, and, for this purpose, we would recommend boiled bone, which contains chiefly phosphate of lime; this may be used most liberally. Whether bones give out heat in the process of decomposition, we cannot say; but, at all events, they promote the escape of moisture, for having tried some hundreds of experiments, with bone, some twelve years ago, as part of the compost to pot plants, we invariably found that those with bone required the most frequent watering.

One of the best of fertilizers, for vine borders, is a mixture of leaf-mould, formed from the prunings and leaves of the vines themselves, mixed with ground bones—one barrow-load of the latter to four of the former.

Another compost, well recommended, is formed of four parts turfy loam, two parts leaf-mould, one part horse-droppings, and one part bone-dust.

A barrow-load of either of the above composts is not too much to point in over the roots of each vine.

Cider Lees.—Mr. J. Hayward recommends these as a manure for the vine. He says that—

One quart of cider, or cider-grounds, added to two gallons of water, brings a grape-vine to a more prolific state than anything else. This mixture must be supplied in such quantity as will saturate the earth to the depth of the roots, and all over the surface occupied by the roots. It must only be given once in the year; and if repeated the second year, its good effects will be sustained for several years afterwards without further supplies. The apple, pear, and fig, are alike benefited by this compound. (*Gard. Chron.* 1841, 413.)

Urine, soapsuds, blood, and animal carcases, have all been recommended as beneficial applications to the vine border, but without any just foundation. The vine is *not* a delighter in a rich soil even in its native country, where the heat and greater exposure to light enables it to elaborate a far larger amount of sap supplied to its leaves from the roots than it possibly can in our more northern latitudes.

The dung of pigs fed on peas and potatoes, and that of cows fed on hay and turnips, have been justly recommended to be applied in small quantities to vine borders, inasmuch as that they contain the saline constituents required by the vine. The wood of the vine has in it a notable amount of silica, and this also is presented in the finest state of comminution by the fœces named.

VINEYARD CULTURE.

THE testimony gathered together in the first section of this work is conclusive that vineyards have been successfully cultivated, and good wines made from their produce, from the earliest Saxon period down to the dawn of the present century. We have quite sufficient evidence also to convince us of that which we should have concluded even without evidence, viz. that the quality of the wine thus made was like that of the lighter French and Rhine wines. The strength and lusciousness of wines is dependent upon the richness of the grape-juice from which they are made—the less rich the juice the lighter the wine; and we should anticipate from our climate, that our vineyard grapes would yield a juice deficient in richness, and therefore be productive of wine of a strength equal to those of the Rhine. The chief reason for vineyard culture being abandoned in England arose from the taste which gradually prevailed in this country for the stronger wines of Portugal and Spain. The taste for the lighter wines of Europe is now in the ascendant; and we believe, in the southern counties of our island, vineyards might be cultivated yielding wines quite worthy of satisfying this improved state of the national palate.

The following are the particulars of the mode of cultivation pursued in one of the last successfully cultivated vineyards. It was found by Sir H. Bunbury among the papers of his ancestor, Sir T. Harmer, who, during the time of Charles the 1st, was an exile in France, and learned there, probably, some part of the art of vineyard culture, which he practised at Blackheath.

"The soyle of this vineyard (which was a part of Blackheath, near Greenwich, in Kent) is extremely barren (as it seems to be), of a light whitish sand mixed with small stones; on the earth naturally grows nothing but ling and furze. The situation is on the side of a hill, which lyes full facing on the south, well defended by the hills from the north and west winds. The parcel of ground was betwixt one and two acres. The earth was, in the summer time or autumn, digged into shallow trenches and ridges. A little before or after Christmas, as the weather was open and fair, the young-rooted vines (which came most from cuttings, and were of three years' growth in the nursery before removing hither) were set in the trenches here in straight lines two yards asunder each vine. Betwixt each rank of vines there was a path four feet wide, to go betwixt the vines and digg and prune them; from each root two of the strongest shoots only were suffered to grow up every year, which were tied up to a stake of about four feet high, and so stood till the bind vines began to sprout out, which was in April; and the tops of each of these two shoots are bowed down to a stake, struck betwixt every two roots, and tied archwise to the said stake; one of the two branches tied to the right-hand stake, and the other to the left-hand stake. Remember in May and June, when the vines are archt thus, and that they flower for grapes, to nip or cut off the great wild red shoots above the flowers, to feed and give them sap the better. These two shoots aforesaid, bowed so down, put forth young branches at the joints, which will fall and hang down to the very earth, and bear grapes to the ground. The lowest grapes are sweetest, and are ripe soonest, because of the reflection from the earth. Every year the root from whence the aforesaid two shoots grow, will put forth several new shoots, which must be suffered all to grow till pruning-time, which is from Christmas till March: in that time you must cut away the said two old shoots within one joint of the head of the old stock (which head should not be a foot higher than the earth), and suffer the two strongest new shoots of this last year to stand up to be tied to the stake till they are archt down in April or March as aforesaid. Then you must cut away close all the sprouts and shoots besides the two aforesaid from the root and head of the stock, except two only, which must be the strongest next to the first two, and those two must not be cut of more than two eyes or joints of the stock, and are left so to serve for the two shoots for the year following, when the other two shoots are cut away. And this order must be observed yearly in prunings of these vineyard vines. The prunings of vines which grow high on walls or trees is quite another way. Colonel Blunt says that vines cannot stand too dry, nor never need watering, and prosper best in a shallow earth, where the roots cannot run down deep as on rocks or gravel. Springs must be drained away from a vineyard, if there be any; the roots cannot endure wet. The Colonel says he uses no dung nor compost to this barren earth of his vineyard, which is very strange. The ground must be kept clean from weeds with hoeing, and the weeds may lie to rot about the bind-roots. The fittest vines for a vineyard in England are thought to be the White and the Red Muscadin; the Red Corant grape with stones, and the several Frontiniac vines, as good as any, or better." (*Gard. Chron.* 1841, 598).

The practice of Sir T. Hanmer, as here related, points at once to the fundamental principles which must be borne in mind, in order to attain to successful vineyard culture in England.

A slope, with a very considerable inclination to the south, is, in the first place, indispensable. Next in importance, we would say, is a shallow, friable, and, if possible, darkish coloured soil: such must, we conceive, have been the character of the Blackheath soil, which is noted, we believe, for its great proportion of silver sand. Thirdly, the character of the subsoil is most important, as we have already pointed out in a previous section. Rampant growth must be held in check, and this can never be done in deep and rich soils.

We cannot, however, consider it necessary to abstain from the application of manures altogether, for a great consideration is involved in a judicious use of them. And here we would draw a distinction between the application of organic and inorganic manures. As far as the question of mere nutrition is concerned, no doubt, in these days, a sprinkling of guano, or other such concentrated manures, might answer well. The object, we conceive, in a vineyard, however, on a shallow soil, should be to attract and sustain on the surface a net work of fibrous roots, and those would need shelter of some kind, or they would be of too fitful a character to be of service. This shelter is afforded naturally, we conceive, to all trees, by the annual deposit of leaves—for a hint in this respect may be taken from the woodlands, where we have many times observed a complete net work of the kind, and from which, we have no doubt, the trees derived no small amount of nutriment. It may here be asked, what essential difference there is between the action of surface roots, such as here described, and those deeper in the soil, with regard to the success of the vineyard? To this we answer, that surface roots are more sensitive (if we may use the term) to atmospheric changes, and this we cannot but regard as one of the greatest desiderata in the culture of plants of all kinds from warmer climes. For here the same surface roots, which are the first to answer to the returning warmth of spring, are the first, also, to receive a check from a July sun; and such checks are found to be in some degree necessary in these northern climes, both with the vine and the peach, in order to prevent rampant growth, and to enable the tree to regain and concentrate its elaborative powers, with a view to perfecting both wood and fruit. If any one doubt the correctness of this mode of reasoning, let him look at the other side of the picture.

A bloated peach tree, for instance, in a soil of a yard in depth, making shoots strong as the grossest willow, and continuing such growth, in despite of all pruning operations, even to the end of October. Is this the tree that we shall look to for fine fruit, or for stability of constitution?

We would here beg to observe, that the digging amongst vines is a most questionable operation; modern practice is quite opposed to it. If the soil is rightly constituted, mechanically speaking, why disturb the roots after getting possession? Sufficient nourishment may be imparted by a system of top dressing, without sacrificing a host of valuable fibres.

How many vines, as well as pears, apricots, &c., do we see, in travelling through the country, thriving, and continuing for a great number of years, with a pavement or a hard foot path over their roots? Surely, then, a regular system of top dressing will suffice, and save some trouble.

Top dressings, for this purpose, might be easily provided in one corner of the vineyard, by collecting the rakings under timber trees, and adding thereto a small amount of manure. The droppings of hedges in the vicinity might be collected in a heap for burning, and covered up with the yearly collection of weeds: this being charred, might be blended with the leaves and manure, and lay until half decayed. This, then, would form a valuable and most economical dressing for the vineyard; a sprinkling of this might be applied every second year, although, we should say, a very little, annually, would be better applied in November.

Much of the success of a vineyard must, after all, depend on judicious thinning, stopping, &c. And here, one main point to be kept in view is, to prevent the laterals from shading too much the principal leaves, for on those the greatest reliance must be placed as to the elaboration of the juices, which give flavour to the fruit and promote the ripening of the wood.

To the foregoing slight outline of the vineyard-practice, pursued in this country about two centuries since, we will now add a record of a similar culture, successfully adopted scarcely fifty years since in the county of Surrey, and which coincides pretty closely with our own views.

The Hon. Charles Hamilton established this vineyard at Pain's Hill. It was on the south side of a gentle hill; the soil a gravelly sand. It was planted entirely with two sorts of Burgundy grapes, the Auvernat and the Black Cluster. The first year he attempted to make red wine in the usual way, but it was very harsh and austere; the second he succeeded better in making a white wine, which nearly resembled Champagne in flavour; in two or three years, as the vines grew stronger, the wine had a finer flavour than the best Champagne. He sold it to wine-merchants for fifty guineas a hogshead, and one wine-merchant to whom he sold five hundered pounds worth at one time, assured him, that some of the best of it realized from seven shillings and sixpence to ten shillings and sixpence the bottle. After many years experience Mr. Hamilton let the grapes hang till perfectly ripe; they were then carefully cut off with scissors, and brought home in small quantities, to prevent their heating or pressing one another: then they were picked off the stalks, and all the mouldy and green berries were thrown aside, and sound ripe ones only put into the press; the pressing was done in a few hours after they were gathered. As fast as the juice ran from the press, it was put into hogsheads, and closely bunged up. These were left all the winter in a cool barn. When the fermentation was over, the wine was racked off into clean hogsheads, and carried to the vaults, before any warm weather could raise a second fermentation. In March, if any of the wine was not quite clear, it was fined down with isinglass. All were bottled at the end of March. In about six weeks the wine would be in perfect order for drinking, and be in prime order for about one year. The second year the flavour and sweetness abated, and gradually declined till they failed entirely. Some that was kept sixteen years became very like old Hock. The only art ever used was putting three pounds of white sugar-candy to some of the hogsheads, when the wine was first tunned from the press, in conformity to a taste that then prevailed for very sweet Champagne. Mr. Hamilton, on this experience, declared himself convinced, that much good wine might be made in many parts of the south of England; many soils and situations being fitter for a vineyard than his, which was much exposed to the south-west winds, and on a declivity rather too sharp. He allowed that the uncertainty of our climate is much against vineyards, and that many fine crops have been spoiled by May frosts and wet summers; but that one good year balances many disappointments. (*Miller's Gard. Dict.*)

Such were the results of Mr Hamilton's experience, and the culture adopted by him seems to have been the following, being detailed by the same author.

Soil.—The best soil for a vineyard in England is a light sandy loam, a foot and a half or two feet deep, with a subsoil of gravel or chalk, either of which are good for vines; but if the soil is deep, or the bottom either clay, or strong loam, it is quite unfit for this purpose.

The situation should be on the north side of a river, upon an elevation inclining to the south, with a slight gradual descent, that the moisture may the better drain off. If, at a distance, there are larger hills, which defend it from the north and north-west wind, it will be of great service as a shelter from the cold winds. The country about this should be open and hilly, for if it be much planted, or low and boggy, the air will constantly be filled with moist air, occasioned by the plentiful perspiration of the trees, or the exhalations from the adjoining marshes. These vineyards should always be open to the east, that the morning sun should come on them to dry off the moisture of the night early, which, by lying too long upon the vines, greatly retards the ripening of their fruit. And since the fruit of vines is rarely ever injured by easterly winds, there will be no reason to apprehend any danger from such a situation, the south-west, north-west, and north winds being the most injurious to vineyards in England.

Preparation for Planting.—In the spring, plough the soil as deep as the surface will admit, turning the sward into the bottom of each furrow; after this it should be well harrowed, to break the clods, and cleanse it from the roots of weeds.

Planting.—After a good fallow, with frequent ploughings and harrowings, in the autumn the rows should be marked out from south-east to north-west, at the distance of ten feet from each other; and these rows should be crossed again at eight feet distance, which will mark out the exact places where each plant should be placed; so that the vines will be ten feet row from row, and eight feet asunder in the rows. It is usual to suppose that the sweetest and best sort of grapes should be planted, but this is contrary to the general practice of the vignerons abroad, who always observe, that such grapes never make good wine; and, therefore, make choice of those grapes which are austere, and not palatable. This is also agreeable to the constant practice of our cider-makers in England, who always observe, that the best eating apples make but poor cider; whereas the more rough and austere sorts afford a strong vinous liquor. When the plants begin to shoot, there should be a small stick of about three feet long stuck down by each, to which the shoot should be fastened, to prevent its breaking or lying on the ground; so that as the shoots advance, the fastening should be renewed, and all small lateral shoots constantly displaced, and the ground between the vines always kept clean. This is the whole management which is required the first summer. But at Michaelmas, when the vines have done shooting, they should be pruned. Cut down the shoots to two eyes. At the beginning of March the ground between the vines should be well dug, but be careful not to dig deep close to the vines, lest their roots should be cut or bruised. At the beginning of May, when the vines are shooting, there should be two stakes fixed down to the side of each plant, which must be somewhat taller and stronger than those of the former year; to these the two shoots should be fastened, and all the small trailing or lateral shoots be constantly displaced, that the other shoots may be stronger; and the ground should also be kept very clear from weeds as before. The autumn following, those which have produced two strong shoots of equal vigour, must be cut down to three eyes each; but in such as have one strong shoot and a weak one, the strong one must be shortened to three eyes, and the weak to two; and such vines as have produced but one stong shoot, should be shortened down to two eyes also, in order to obtain more wood against the succeeding year. In the spring, about the beginning of March, the ground between the vines should again be dug as before, and two stakes should be placed down by the side of all such vines as have two shoots, at such distance on each side of the plant as the shoots will admit to be fastened thereto; and the shoots should be drawn out on each side to the stakes, so as to make an angle of about forty-five degrees with the stem; but by no means should they be bent down too near the earth. In May, the vines must be carefully looked over, and all the weak shoots rubbed off as they are produced ; and those shoots which are produced from strong eyes, should be fastened to the stakes to prevent their being broken off by the wind. This management should be repeated at least every three weeks, from the beginning of May to the end of July, by which means the shoots which are trained up for the succeeding year will not only be stronger, but also better ripened and prepared for bearing. In autumn, this being the third year for planting, the vines will now be strong enough to produce fruit, therefore they must be pruned accordingly. If the two shoots of the former year, which were shortened to three eyes, have each of them produced two strong branches the summer past, then the uppermost of these shoots upon each branch should be shortened down to three good eyes, never including the lower eye, which is situated just above the former year's wood, which seldom produces more than a weak shoot; and the lower shoots should be shortened down to two good eyes each, to produce vigorous shoots for the succeeding year, and the former are designed to bear fruit; but where the vines are weak, and have not produced more than two or three shoots the last season, there should be but one of them left with three eyes for bearing; the other must be shortened down to two, or, if weak, one good eye, in order to obtain strong shoots the following summer; for there is nothing more injurious to vines than the leaving too much wood upon them, especially while they are young, or the over bearing them, which will weaken them so much that they will not recover again in several years. In March, the ground between the vines should be slightly forked, observing not to injure their roots by digging near them. On each side of the vine should be a stake put at about sixteen inches from the foot, to which the two branches, which were pruned to three eyes each, for bearing, should be fastened (observing, as was before directed, not to draw them down too horizontally); then another taller stake should be placed at the foot of the vine, to which the two shoots which were pruned down to two eyes should be fastened, provided they are long enough for that purpose: but, if not, when their eyes begin to shoot, these must be trained upright to the stakes, to prevent their trailing on the ground, hanging over the fruit branches, or being broken by the wind.

In May, the vines should be carefully looked over again; all weak lateral branches rubbed off as they are produced; and those shoots which shew fruit, fastened with bass to the stakes to prevent their being broken, until they are extended to two joints beyond the fruit, when they should be stopped; but the shoots which are designed for bearing the following season, should be trained upright to the middle stake. This method should be repeated every fortnight or three weeks, from the beginning of May to the middle of July, which will keep the shoots in their right position, whereby the leaves will not be inverted; which greatly retards the growth of the fruit; and by keeping the vines constantly clear from lateral shoots, the fruit will not be overshaded. When the fruit is ripe, if the stalks of the bunches are cut half through a fortnight before they are gathered, the juice will be much better, because there will not be so great a quantity of sap enter the fruit, whereby the watery particles will have time to evaporate, and the juice will be better digested. This is practised by some of the best vignerons in the south of France. But if, after the fruit be cut, it is hung up in a dry room upon strings, so that the bunches do not touch each other, for a month before they are pressed, it will also add greatly to the strength of the wine, because in that time a great quantity of the watery parts of the juices will evaporate. This is a constant practice with some who inhabit the Tyrolese, on the borders of Italy, where is made a most delicious rich wine. But even with all the care that can be taken, the wine will not be so good while the vineyard is young, as it will be after it has been planted ten or twelve years; and it will be constantly mending until it is fifty years old. The vineyard being now arrived to a bearing state, in pruning there should never be too many branches left, nor those too long; which is found to be of so bad consequence to vineyards, that when gentlemen, abroad, let out vineyards to vignerons, there is always a clause inserted in their leases to direct how many shoots shall be left upon each vine, and the number of eyes to which the branches must be shortened; because, were not the vignerons thus tied down, they would overbear the vines, so that in a few years they would exhaust their roots, and render them so weak as not to be recovered again in several years; and their wine would be so bad as to bring disrepute on the vineyard. Constantly keep the ground clean between the vines, fork it carefully every spring, and every second year manure it. If the land be stiff and inclinable to bind, then lay on sea-sand, or sea-coal ashes; but if it be loose and dry, a little lime, mixed with dung, is the best manure. Spread it thin upon the surface, and in forking bury it equally in every part. It is much preferable to all dung, and where the vineyard is large, half may be manured every year. After this is done, place the stakes, one on each side, at about sixteen inches from the stems, to which the longest bearing branches should be fastened; and one stake on each side close to the stem, to which train the two shorter branches upright, to furnish wood for the succeeding year.

In the summer look over the vines carefully, rubbing off all weak shoots, and training the good ones to the stakes regularly as they are produced. Stop those which have fruit in June, two or three joints beyond the bunches; but the upright shoots, which are designed for bearing the following year, must not be stopped till the middle of July, when they may be left about five feet long.

All this summer-dressing should be performed with the thumb and finger, and not with the knife, because wounds made by instruments in summer do not heal so soon; and the shoots being very tender whilst young, may easily be stopped by gently nipping the leading bud. (*Miller's Gard. Dict.*)

WALL CULTURE.

We would here observe, preliminarily, that the successful cultivation of the vine on walls must be based on the principle of *ripening the wood.* Now, any extraordinary amount of grossness in the habit of the plant, superinduced by a too liberal use of stimulating manures, will in a corresponding ratio defeat the end in view. Not but that the vine on a wall—especially an artificially heated one—will endure a greater stimulus in this way than those of the vineyard; yet more evils will be found to arise from an over luxuriant growth than perhaps from any other cause. In an over luxuriant growth the leaves are much larger, and the disposition to produce laterals greater. We conceive that this is no real advantage, but rather the reverse. For what can be the advantage of producing one leaf which occupies the place of two ordinary ones, or overlaps other leaves, thus obstructing the light from what would otherwise have been efficient organs? Moreover, the disposition to produce laterals is greater; and if any neglect occurs in stopping these in due time, the sure consequence is so much time lost, which cannot possibly be regained, provided the rambling laterals have been this while shading the principal leaves. It should be remembered, at all times, in the cultivation of the vine, that the rapid production of laterals, in defiance of frequent stoppings, is a sure argument of a powerful root action. But of what use is a root action so much in advance of the top? The one under continual control—the other with unlimited power to range in search of food. Therefore, let it be borne in mind that much of the success will depend on a due preservation and exposure of the main leaves to the full influence of solar light. The object here should be perfect maturation—not mere size of berry.

Aspect.—The object to be obtained is not only warmth, but shelter from the wind, which is injurious to the vine at all times of its growth. To secure this desideratum, the best aspect is S.E. Any westerly point, or even due S., exposes the vine to the strong winds which prevail from the W. and S.W.

Soil and Manures.—Full particulars on this head will be found at p. 99; but, in addition, we may observe that the practice is good adopted by Mr. Shiells, gardener at Erskine House, near Glasgow. Every winter he mulches over his border where wall vines are growing with littery dung. In the spring the strawy part is taken off, and the remainder forked lightly in. The border is well watered with drainings from the dunghill two or three times in the course of the season. (*Gard. and Flor.* ii. 128.)

Planting—The best time for planting the grape-vine is from the end of October to the same period of November; but it will generally succeed if planted in open weather during the winter and until the end of February. Each plant will be several feet long, if only a year old; and if grown in a pot, turn it out with the ball whole, and in any case make a hole about two feet six inches from the wall, and deep enough to lay the ball in, almost on its side, or to spread the roots, as the case may be, full three inches below the surface; open the ground nearly to the wall, and with hooked pegs fasten down the stem three inches below the surface, turning it up within half a foot of the wall, and cutting the plant down so as to have but two eyes above the soil. The object of thus laying in eighteen inches of the plant above the root is to increase the supply of nourishment to the plant; every eye under ground will form roots, and give vigour to the shoots. Care must be taken to water them regularly, and if the ground be not as rich as you wish, use liquid manure. (*Gardener and Flor*. iii. 9.)

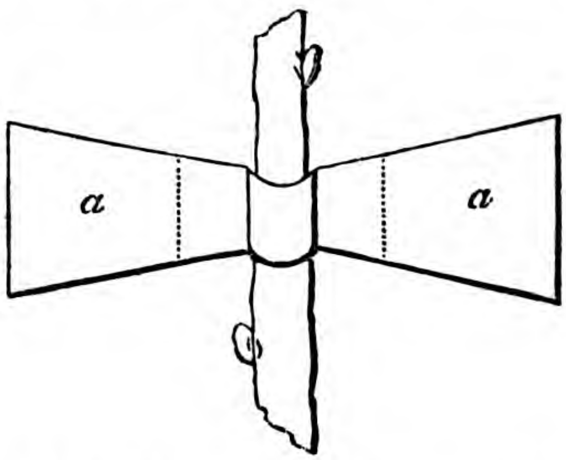
Walls, for the grape vine, need never be higher than eight feet, and the more substantial the better, as they cool slowly in proportion to their thickness. They should be painted annually with a creamy mixture of one part lime and two parts soot, to fill up the nail holes, the harbours of insects, to destroy moss, and to increase the warmth of the wall. Although a dark-coloured body radiates heat, and consequently cools more quickly than a similar body of a light colour, yet this is prevented if a proper screen is placed before it.

Those who do not possess an artificially heated wall, should certainly have a permanent coping of some six inches in width. In addition to this, moveable boards on brackets, projecting six inches more, will be found of considerable service in the months of May and June, and again in October. By arresting, or preventing radiation, and by intercepting the action of the hoar frost—which, for the most part, acts in a perpendicular direction at those periods, wind generally being absent when such occurs, the coping will be found of much service.

Much has been said about the injury sustained by the loss of refreshing dews and rains;—how, then, do fruit-bearing trees exist, nay, thrive in forcing houses, where the dews and rains never penetrate? The accumulation of heat, and the preservation of it afterwards, is, after all, the great point to be borne in mind.

Training.—On walls, no mode of attachment seems superior to the old nail and shred, but when the vine is trained against a cottage, and extends from the wall to the roof, here some other mode of fastening is required, unless a trellis is employed. Sprays of willows, twisted and bent in the middle so as to form a fork, are usually employed to fasten the branches upon tiling, the forks embracing the branch, and their long ends being thrust under the tiles. Another mode, which is especially adapted to slate roofing, is the following:—

Take pieces of tin, six or seven inches in length—

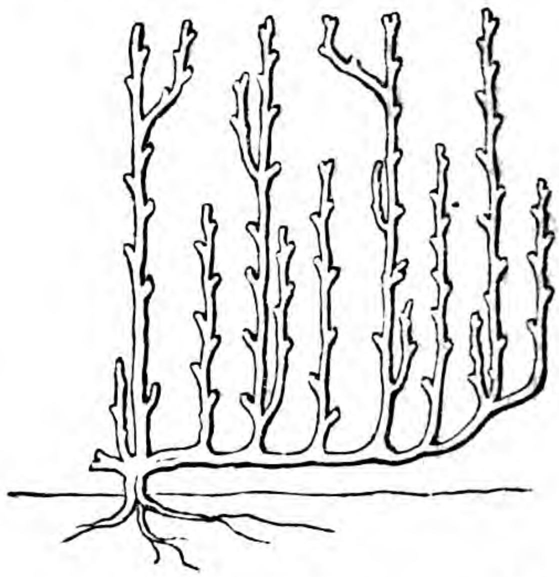


the refuse of the tin-workers' shops will do—and, at convenient distances, turn it over the shoot intended to remain, and thrust part of the two ends (*a a*) between the tiles or slates. The weight of the incumbent tile or slate will be sufficient to keep the shoot in its place, so as not to be disturbed by winds. (*Gard. Mag.* ii. 43.)

Pruning must always be controlled by the knowledge, that the grape vine bears *only* on wood one year old, and that all older wood, that can be spared, should be removed. There are two modes of pruning the grape vine, and distinguished respectively as the "spur system" and the "long rod system." Neither of these enable a vine to bear with impunity more than a certain weight of grapes, but the spurring enables many, but smaller bunches, to be grown, whilst on the long rods the bunches are fewer and finer.

Spur System.—Mr. Paxton gives the following directions for this mode of pruning:—

The sketch represents a portion of the vine when thus pruned in autumn, with short rods of five or six eyes each, left at convenient intervals on the oldest branches throughout the vine. The perpendicular main shoots should not be less than two feet apart, and when pruning them, no eye should be allowed to remain but where a shoot is desired in the following season. By attending to this the vine will not have to develop (as is usually the case) an immense quantity of superfluous branches; and although this operation may appear a tedious one at the time of



pruning, a great saving of labour and time will be effected at a busier period in spring, and the quantity of fruit may be easier regulated in proportion to the strength of the vine. If this is attended to, nothing will be required in summer but securing the young fruit-bearing shoots to the wall, and shortening them at one joint above the bunch as soon as the fruit is set, excepting the leading shoots, which should not be stopped until the lower part is ripened; otherwise, the main eyes for the next season may be induced to grow prematurely. In autumn, the young wood from the spurs is shortened back to one or at most two eyes, and the terminal shoots in proportion to their strength; but for the strongest wood, from eight to twelve eyes will be found as many as will break well. When commencing to train a young vine in this manner, the side branches should not be brought to the horizontal position at first, but be lowered gradually as the number of suitable branches for upright stems are obtained; by this means they acquire strength faster than if at first trained horizontally. (*Gard. Chron.* 1842, 757.)

Another spur-system of pruning the vine is practised at Thomery, near Fontainebleau, and is thus described by Mr. John Robertson :—

Walls and Treillage.—The walls are eight feet high, built of clay, plastered and washed over with mortar of lime and sand, and covered by a coping of boards or straw, projecting 9 or 10 inches on each side. The treillage is formed of upright rails 18 or 20 inches apart. The south, west, and eastern sides of the wall are employed. The chief peculiarities of the culture are, allowing only two branches to proceed from each vine, and planting the vines several feet from the wall. The spurring system of pruning is employed, and it will be seen that the success depends principally on these three particulars.

The main branches of each particular vine plant assume, above ground, the form of the letter T, each arm being 4 feet long, the spurs 7 inches apart, and the upright stem being shorter or longer accordingly as the two arms or horizontal branches are higher or lower on the wall. The horizontal branches are placed 18 inches apart, the lowest being 6 inches from the ground, so that a wall eight feet high will contain five lines of mother branches. If the plants

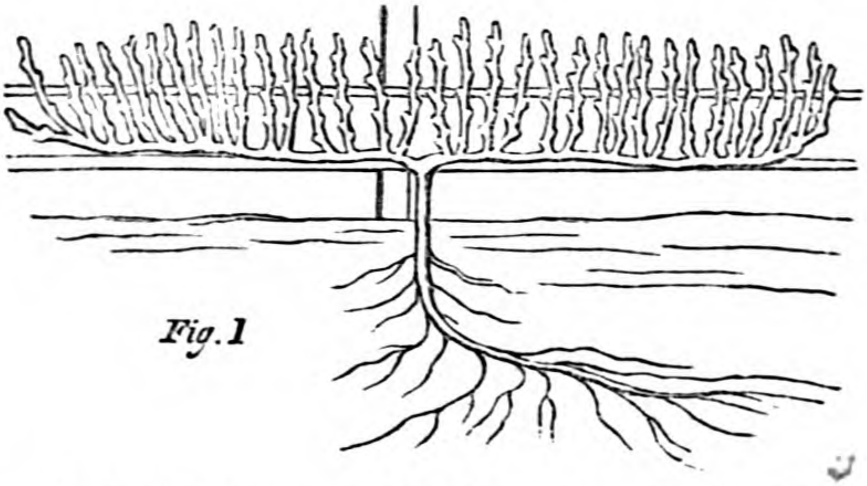


Fig.1

are all planted on one side, their stems at the base of the wall will be 18 inches apart; but in very poor situations they are planted on both sides of north walls, and the stems of those on the north side brought

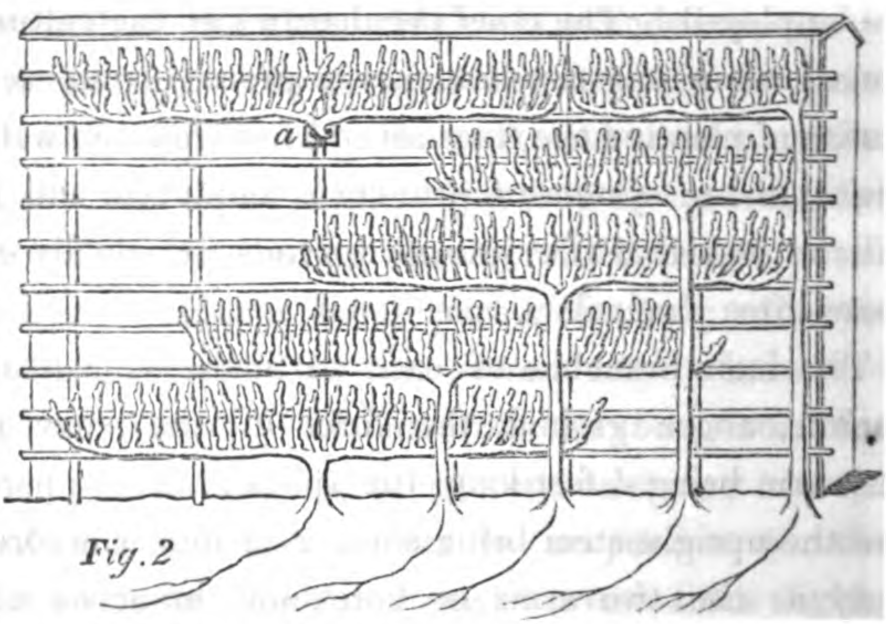


Fig.2

through holes in the wall to the south side. *(Hort. Soc. Trans.* vii.—*Gard. Mag.* v.*)*

During the formation of the cordons, the spurs on their arms will successively come into bearing; and each, when pruned down at the season to two or three eyes, will produce as many shoots with fruit. Of these, at the next winter's pruning, only the lowest shoot is to be suffered to remain, and that at the same time is to be cut back to one, two, or three eyes, according to its strength. The eyes at the bottom of the spurs are very small and much crowded; there are at least six within the space of one-sixth part of an inch. When the spurs are cut to the length of one or two inches, these small eyes are robbed by those above them; but when the spurs are cut short immediately above these eyes, they then break, develop themselves, and produce good bunches. Of this the vignerons of Thomery are well aware; they never leave their spurs more than one inch long, and sometimes less—by which means they always keep the bearing-wood at home; and, extraordinary as it may appear, spurs that have borne for twenty years are no more than one inch long. Should more than two shoots break from a spur, all above that number are suppressed, and not more than two bunches are left on each side of these; for a moderate crop of good grapes proves of greater value than a more abundant crop of inferior quality. When the space of walling allotted to the five cordons is completely occupied, about 8 feet square, or 64 square feet, are filled, and the produce calculated on is 320 bunches; for each arm being 4 feet long, and furnished with spurs 6 inches apart, the two arms will carry 16 spurs of two eyes each; and allowing two bunches to every eye, each tier or cordon should bear 64 bunches; the number on five cordons will consequently amount to 320. This precise length of 4 feet to each arm has been determined, by experience, to be the fittest. The vignerons found that when the arms were left of a greater length, the spurs in the centre gradually declined, and good bunches were produced only at the extremities of the cordon; but when reduced to 4 feet, the spurs on the whole length were perfect, their eyes well filled, and the bunches of fruit fine and well swelled. Training in cordons after this manner affords these additional advantages; every portion of the wall is equally furnished with bearing-wood, and when once the cordons are completed the pruning and training becomes so uniform and simple that it may be entrusted to any intelligent workman. But what renders this practice of still greater value in this country is, that the fruit on these small spurs always ripens earlier than on the stronger wood. (*Ibid.*)

In all training, the distance required to be between the bearing shoots must, in some degree, be regulated by the size of the foliage each variety produces. Some varieties have leaves 12 inches in diameter, and of others this is no more than 6 inches : the shoots of the latter might be twice as near as those of the other without being more crowded. This deserves more attention, and it is to aid this that we have given the diameters of the leaves of some varieties in the alphabetical catalogue. These diameters were all observed at Welbeck, under one system of management, by Mr. Speechley.

Long Rod System.—As Mr. Clement Hoare's practice is founded upon this, we adopt his rules without any modification. He obtains, he says,—All the fruit of a vine from a few shoots trained at full length, instead of from a great number of spurs or short shoots. To provide these shoots the former bearers are cut down to very short spurs at the autumnal pruning, and at the same time a sufficient number of shoots are left at whole length to produce fruit in the following year; at the succeeding autumn these latter are cut down to very short spurs, and the long shoots that have pushed from the spurs are trained at whole length as before, and so on annually in alternate succession. This method recommends itself by its simplicity, by the old wood of the vine being annually got rid of, by the small number of wounds inflicted in the pruning, by the clean and handsome appearance of the vine, and by the great ease with which it is managed, in consequence of its occupying but a small portion of the wall.

"1st. In pruning, always cut upwards, and in a sloping direction.

"2nd. Always leave an inch of blank wood beyond the terminal bud, and let the cut be on the opposite side of the bud.

"3rd. Prune so as to leave as few wounds as possible, and let the surface of every cut be perfectly smooth.

"4th. In cutting out an old branch, prune it even with the parent limb, that the wound may quickly heal.

"5th. Prune so as to obtain the quantity of fruit desired on the smallest number of shoots possible.

"6th. Never prune in frosty weather, nor when a frost is expected.

"7th. Never prune in the months of March, April, or May. Pruning in either of these months causes bleeding, and occasions thereby a wasteful and an injurious expenditure of sap.

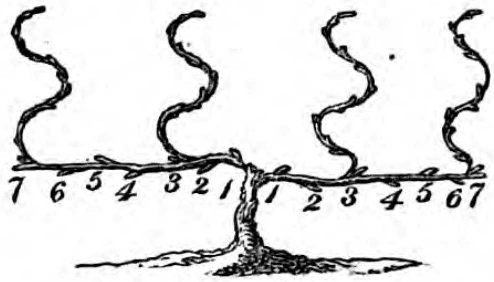
"8th. Let the general autumnal pruning take place as soon after the first of October as the gathering of the fruit will permit.

"Lastly, use a pruning-knife of the best description, and let it be, if possible, as sharp as a razor." (*Hoare on the Vine.*)

In the *spring next after the planting*, two buds only having been left, remove the one which shoots the most weakly, and rub off all others but that one selected to remain as often as they appear. Nail the shoot to the wall as often as it extends six inches beyond the previous shred. In November cut the vine so as to leave only two buds. In the *second* spring manage as before, and in the November cut down to three buds; the vine will then appear as in this sketch.

The *third* spring retain two shoots, treating as before. In September pinch off their tops, and in November prune them so as to retain seven buds.

The *fourth* spring, in February, remove the 1, 2, 4, 5, and 6 buds, bending the shoots down horizontally thus:



and training the shoots from buds 3 and 7, as here represented. Prune and train as before directed during summer, removing also superfluous shoots, and in November cut back seven on one side and three on the other to about eight or twelve buds, according to the strength of the vine; and the other seven and three so as to leave only one bud on each. In the *fifth* spring, train the shoots from these single buds in the same waving form as before.

"The vine," says Mr. Hoare, to whose valuable work I am indebted for most of the preceding directions, "has now assumed the form which it is permanently to retain, and the manner in which it is trained may be considered as the commencement of a system of alternately fruiting two shoots, and training two at full length for bearing-wood in the following year; which method may be continued every year without any alteration, until the capacity of the vine is equal to the maturation of more fruit than can possibly be borne by two single shoots, which, on an average, may be estimated at sixty pounds weight annually. Several years must elapse before this will be the case; but when it is, the arms may be easily lengthened by the training in of a shoot at their extremities, and managing it in the same manner as when the arms of the vine were first formed. It is very advisable, however, that the vine should not be suffered to extend itself further on the wall, for in such case, the bearing shoots emitted from the centre are sure to decline in strength; whereas, by confining the dimensions of the vine to a single arm on each side of the stem, and each arm to the support and nourishment of two branches only, the very best description of bearing shoots will never fail to be generated close at home, and these, as the vine advances in age, will become prolific almost beyond conception. I have often ripened as many as seven full sized bunches of grapes on two shoots which have pushed from a single bud, on vines managed in this manner. Indeed, those who have been accustomed to permit their vines to cover a large space of walling, and to possess a great number of branches, can scarcely imagine how much easier a vine is managed, and with what certainty the fruit is increased in quantity, and improved in quality." *(Hoare on the Vine.)*

Summer Pruning.—Whatever may be the system adopted there are certain general rules which may be followed applicable to both, which may be best arranged under the two heads of Summer and Autumn pruning.

At the end of *April* rub off the small shoots which accompany the principal. About the middle of *May* the shoots will begin to require nailing to prevent their breaking or overshadowing each other. Remove such as are too crowded, or that do not shew fruit, unless required to fill vacancies. If a shoot in a desirable position grows from the wall, or foreright, it must be gradually brought to it by bending it slightly at first by a shred, 18 inches long or more, passed round the shoot about 9 inches from the old wood. In a week a shorter shred may be used to bring it up closer to the wall, and so by degrees until the shoot is reduced to the desired position. In *June* nip off the tendrils from the footstalks of the bunches, as well as the lateral shoots; leaving about an inch above their first joints. If these laterals are just above a bunch of grapes, leave two joints. The shoots intended for bearers may now be selected, allowing the strongest and most short-jointed to remain. Attend carefully to nailing in the shoots as they extend, placing shreds not more than 12 inches apart. At the end of the month any old branches may be cut off without fear of bleeding, and all fresh shoots must be rubbed off as they appear. In *July*, or so soon as the blossom is fully expanded, refrain from moving the shoots, and, if boisterous winds occur, it is very beneficial to protect the vines by a close-meshed net. Nip off all successional shoots as they appear. So soon as the berries are as large as peas, about the end of July or early in *August*, and the finest bunches can be ascertained, cut off all the bunches above those required to make up the amount which Mr. Hoare says ought to be left on a vine. In making this calculation each bunch may be calculated at half a pound weight. If the vine's stem measures, just above the ground, three inches in circumference, it may bear 5 pounds weight of grapes.

$3\frac{1}{2}$ inches	. .. ..	10 lbs.
4 "	. .. ..	15
$4\frac{1}{2}$ "	. .. ..	20
5 "	. .. ..	25

And so five pounds additional for every half inch of increased circumference.

Remember in doing this that it is much better to have many fewer bunches than the vine can ripen without being weakened, than to have one bunch in excess, for the vigour of the vine will be increased by not over-bearing.

Do not pluck away leaves that too much overshadow the fruit, but merely by a shred or string bend them in another direction. The thickness of one leaf shading grapes, does not at all hinder their ripening.

It is a mistake to imagine that the sun must absolutely shine on them for effecting that process. Nature intended no such thing when heavy clusters were caused to grow on slender stalks, and to hang below the foliage of branches attached to trees by their strong and numerous tendrils. On the contrary, it is evident that vines naturally bear their fruit in such a way as to screen it from the sun; and man is most unwise when he rashly interferes with this intention. What is wanted is the full exposure of the leaves to the sun; they will prepare the nutriment of the grape—they will feed it and nurse it, and eventually rear it up into succulence and lusciousness. (*Gard. Chron.* 1843, 443.)

Early in August thin the berries in each bunch, until not more than half their original number remain. Sometimes many more require to be removed, and the best rule is to cut them out as often as they are found to be crowding. It is best done with a sharp-pointed pair of scissars, and care being taken to remove the smallest berries. This increases the weight and excellence of the bunches, for two berries will always outweigh four grown on the same branchlet of a bunch, besides being far handsomer, and having more juice as compared with husks. During the whole summer, at least once a week, the vine borders should be well hoed, not merely to destroy weeds, but to loosen the soil, and admit the air and atmospheric warmth. During very dry weather, also, so soon as the berries are set, liquid manure may be given occasionally, pouring it into a trench, made at least three feet from the stem. In *September* stop, by pinching off the extremity, every shoot intended for future bearing, and finally thin the berries. Various modes have also been suggested for increasing their size, and hastening their ripening. Thus, ringing the bark between every third or fourth eye, the bark being peeled off about an inch in width, makes the vine bear a greater quantity of finer fruit, and the fruit ripen sooner. Only the stems intended to be cut away at the ensuing pruning should be ringed. The ringing should be performed as soon as the sap moves in the spring, and care must be taken not to wound the alburnum in performing the operation. (*Gard. Chron.* 1841, 749.)

That ringing effects, temporarily, the purposes for which it is adopted, there is no doubt, but we would rather recommend root-cutting. To those not thoroughly versed in this matter, such advice may appear to savour of the "blowing hot and cold," and we must confess that the inference would appear at first sight just. When practical men, however, find it necessary to recommend such "drastic" measures, it must not be placed to their mere love of trickery—the true cause will be better sought in the extreme fitfulness of the atmosphere to which it is well known we are proverbially liable. To convey a just idea of the difference between the two processes, we would say the effects of the one are almost entirely confined to the branch operated on, whilst the root-cutting operates, of course, on the whole system of the plant.

To advocate root-cutting, however, with the vine, or, in fact, with almost any other fruit tree, is as good as to admit, that either the tree has been over pampered, or that the soil has been wrongly constituted at first. And, with regard to the latter, which is too often the case, we would strongly recommend the adoption, *in part*, of Mr. Clement Hoare's compost; that is to say, more porous materials, combined with thorough draining. When this is done, there will be little occasion for either ringing or root-cutting.

Mr. Thomas Fleetwood, of Dunnington, near Alcester, hastens the maturity of grapes, on open walls, by the following method. Before the vines are out of flower, he brings each bunch into a perpendicular position by a thread attached to its extremity, and fastened to a nail in the wall, carefully confining the young branch with the bunch thereon, as close to the wall as possible. Fixed in this way, Mr. Fleetwood says, they ripen a month earlier than when left to hang in the usual way. (*Hort. Soc. Trans.* v.)

Grapes on open walls, in northern parts of England, never ripen, and in its midland counties they rarely ripen well. For the sake of succession, and to those who cannot afford to maintain a hothouse in those districts, or in any other, the following suggestion from Mr. Maund, the editor of the *Botanic Garden*, will be most acceptable:—" Although my experiment is not yet completed, I cannot omit mentioning to you its success. Grapes grown on open walls in the midland counties are rarely well ripened; therefore I provided a small glazed frame, a sort of narrow hand-glass, of the shape shown in the annexed outline, to fix against the wall, and enclosed in it one branch of the vine with its fruit and foliage. The open part, which rests against the wall, is 13 inches wide, and may be of any length required to take in the fruit. The sides are formed of single

panes of glass, seven inches wide, and meet on a bar which may represent the ridge of a roof, the ends enclosed by triangular boards, and having a notch to admit the branch. This was fixed on the branch a month before the vine came into flower. The consequence was, the protected branches flowered a week earlier than the exposed. The frame was not fitted closely to the wall, but in some places may have been a quarter of an inch from it. The lateral branches being shortened before it was fixed, it did not require removal, even for pruning, because I adopt the long rod mode of training, which is peculiarly adapted to my *partial protection system*. The temperature within the frame is always higher than without, sometimes at midday even from 20 to 30 degrees. By this simple protection, I find grapes may be ripened from three weeks to a month earlier than when wholly exposed, and this saving of time will, I believe, not only secure their ripening well every year in the midland counties, but also that such advantage will be available in the north of England, where grapes never ripen on the open walls. I should have told you that the cold nights of spring have caused almost all the young fruit to fall off during the flowering season, excepting where it was protected. (*Johnson's Gardener's Almanack.*)

Ripeness is first indicated by the berries of the white grapes becoming soft and transparent, whilst those of the black varieties assume a purplish tinge, which increases more and more until the fruit is fully matured. Whenever any change of this nature takes place, all handling and thinning of the bunches must be avoided, as no reduction in the number of the berries can now be of much service in increasing the size of those that are left. In fact they should not be disturbed after they have undergone the first thinning, which it is desirable to give them either previously to their "stoning," or during the period when that process is going forward, which is usually in August or very early in September. The only thing, perhaps, they may afterwards require will be, to train the fruiting branches as close to the wall as possible, taking care at the same time in doing so not to expose the bunches to the scorching rays of the sun, or to allow them to be shaded by more than the thickness of a single leaf. On no account, however, would we recommend the removal of any leaves from the branches, as is sometimes done when they appear to be crowded, under the mistaken notion that, by exposing the bunches to the full action of the sun, it will cause them to ripen earlier, and be higher flavoured. On the contrary, it is worthy of remark, and ought to be generally known, that grapes which are so exposed seldom or never attain the size and flavour of those that hang in close contact with the wall and are partially shaded. The shoots intended for the bearing wood of next year should now be shorteued and closely nailed, so as to receive the full benefit of the wall and be perfectly matured before winter. It will also be advisable to go over the vines again and pinch off the laterals. (*Gard. Chron.* 1841, 596.)

Remove decaying berries as they appear; hang up wasp traps, bag ripe bunches, remove leaves from the borders, and destroy snails, which are among the worst enemies of the grape.

Autumn Pruning.—This commences at the close of October or early in November. On this Dr. Lindley has well observed that, so long as the leaves are in full activity, it is wrong to remove them; but at the end of the season their peculiar offices are nearly at an end, their powers of life become languid, and they add but little to the matter which a tree contains; they do, however, add something until they die. But it may be, that less is added by the leaves than is consumed by the parts that bear them; and if so, to leave them is a loss. This is really the case with a vine, which will go on growing and forming wood that is not wanted, as long as the season will permit. It is, in part, to prevent its going on forming what is not wanted, and has to be thrown away, that early autumn-pruning is to be recommended. (*Gard. Chron.* 1842, 691.)

So soon, then, as the leaves, by their fall and change of hue, intimate that their functions have ceased, and that the elaboration of sap by their agency has ceased, so soon should the operation of *Pruning* commence. This is the general rule; but we shall see that there are some exceptions. Pruning has for its object with the gardener the regulation of the branches of a plant so as to obtain either the blossom or the fruit he desires. If the surface of leaf is reduced too much, blossom buds are produced less abundantly, the sap being expended next year in producing the required and most necessary development of leaves. On the other hand, if the branches be left too numerous, those above shadow those below them, and so exclude the light, as to prevent that elaboration of the sap, without which no blossom buds are formed, but an excessive production of leaves in the vain effort to attain by an enlarged surface that elaboration which a smaller surface would effect in a more intense light. The season for pruning must be regulated in some degree by the strength of the tree; for although, as a general rule, the operation should not take place until the fall of the leaf indicates that vegetation has ceased, yet, if the tree be weak, it may be often performed with advantage a little earlier; but still so late in the autumn as to prevent the protrusion of fresh shoots. This reduction of the branches before the tree has finished vegetating directs a greater supply of sap to those remaining, stores up in them the supply for increased growth next season, and in seasons of similar temperature, the vines pruned the earliest in autumn will unfold their buds the first in the following spring. At the time of autumn-pruning it is advantageous to un-nail the whole vine, doing so by degrees, and employing fresh shreds. Before re-training, it is an excellent practice to brush over the entire surface of the wall with a mixture of soot and lime, made to the consistency of cream with water. In selecting the shoots to remain, prefer those which are hard, short-jointed, and which have large round buds. Get rid of all the old wood you can; scrape off the old dried bark gently, and scrub the stem and main branches with a brine of common salt and water. The best time for applying manures to the border is during dry weather in February.

Flued Walls have been adopted by some cultivators of the vine, but with doubtful success. The best directions for their employment have been published by Mr. Shiells, gardener at Erskine House, near Glasgow, from which the following are extracted :—

About the end of April, or beginning of May, when the clusters begin to appear, a double net is to be placed against the wall to protect the vines upon them, having the upper side of the net fixed over the projecting edge of the coping, and the under side fastened to stakes, placed four feet distant from the wall. This netting allow to remain until the end of June, or until the fruit is set. Fire heat is not to be applied until the middle or latter end of May, in order to bring the clusters to blossom early in June, so that the whole crop may be set by the end of that month. In sunshiny weather very moderate fires are to be kept during the day; and, if the fine weather continues, the fire is to be omitted from the middle of July till the middle of August; after which time the wall becomes considerably shaded by the foliage. The fire is then to be renewed, and kept somewhat stronger than before through the day, until all the fruit is gathered. Mr. Shiell states, also, that in years when there has been little sunshine in summer, he has been under the necessity of beginning to heat the wall about the middle or end of April, and of continuing it night and day until the crop has been gathered. The heat is to be very moderate through the day in bright sunshine, until the leaves have attained their full size, and have partially shaded the wall; but afterwards stronger through the day than the night. At noon, in bright sunshine, the air within three or four inches of the wall is very warm, often 90 or 100 degrees, while at the same time the hand can be held on the hottest part of the wall without inconvenience. Mr. Shiell had no thermometer permanently placed at the wall, and only tried the heat occasionally; but he thought that during the summer months the air at four inches from the wall, at six o'clock P.M., ranged between 60 and 70 degrees, and at six A.M. between 50 and 60 degrees; but it was frequently lower than 60 degrees in the evening, and than 50 degrees in the morning. When the grapes are pretty well coloured, guard them from the birds by means of a net, which also prevents their being injured much by wind and rain; and if the net is previously dipped in coal-gas water, and well dried before being put up, Mr. Shiell says, the ripe grapes are seldom attacked by wasps. He calculated that, near Glasgow, the expense of heating the wall for a season does not exceed thirty shillings upon an average of seasons. Black Hamburgh grapes begin there to colour about the 6th or 10th August, and some are ripe in the latter end of September, or much earlier in fine seasons, if required. In the beginning or middle of November, what remains of the crop is cut, and preserved in a dry room; the fire is then discontinued (for a little fire heat is continued until the crop is off), and in a week or two afterwards, in mild weather, the vines are pruned. The wall is 21 inches thick, and is covered with a saddle-backed coping, projecting four inches on each side, and has a small groove under the edge to intercept the water which flows down the slope of the coping. The wall is about 15 feet high, and the length occupied with vines, and wrought by one fire, is about 36 feet. The bearing branches of the vines are about 2 feet 6 inches apart; the longer branches of the vines, occupying the lower part of the wall, bear only on the upper half of their length; all the others on their whole length. Twenty or 25 clusters of black Hamburgh grapes are considered by Mr. Shiell sufficient for each vine covering a space of wall 12 feet by 10. Muscadines being much smaller, double that number is allowed to remain on each vine. (*Gard. and Flor.* ii. 128.)

Mr. Shiell's practice, as we have already observed, is very good; indeed, the best that has been made public, wherever flued walls are adopted; but his statement of the expense of coal would be found much under the mark in many districts. This, however, is not all; for the trouble and expense of attending fires, flue-cleaning, &c., will be found, on close examination, to form an item in the affair of as great importance as the subject of fuel itself. If heated walls be adopted, it is probable that hot water pipes would be found better adapted for this purpose; or perhaps the Polmaise system might be applied. At the best, however, flued walls will be found to entail much of the expense and labour of a regular hot-house, with much less of either benefit or certainty. We are quite of opinion that now glass is so very cheap, that lean-tos, as they are termed, or, in other words, a sloping glass roof, placed against a south wall, will be found, without any heating apparatus, to possess every advantage over a flued wall.

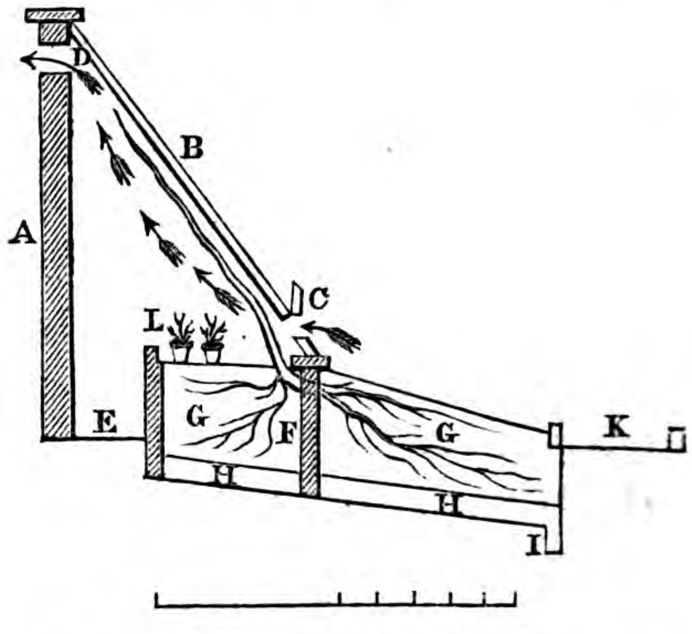
Indeed, so fully are we impressed with the utility of such simple roofs, that we feel sure of their most extensive adoption in a very few years. Here, two wall plates and some rafters are all that are needed, excepting, perhaps, a low front wall, which need not exceed two feet in depth of brick work.

If severe economy were necessary in this case, alternate rows of panes might be introduced, of the very commonest and cheapest glass, and the roof might be formed of strong styles, without a single rafter, in the ordinary hothouse acceptation of that word. These styles might be braced from one end to the other with an iron rod, which would be sufficiently strong without intercepting the light.

To carry economy still farther, if requisite, two feet of the angle of the roof at the top might be composed of mere slate. Structures like this, with a small amount of front and back ventilation, and with the most ordinary amount of attention, would be found to produce the best of grapes, annually, during the months of August, September, and October : and we see no reason why all persons living at the suburbs of towns should not possess a small vinery of the kind. Although digressing from the subject for a moment, we are tempted to submit, whether a simple structure of this kind would not also furnish the possessor with an early rose garden, without compromising the success of the vines. The modern hybridperpetuals, Bourbons, &c., flower early and late, and merely require the exclusion of frosts. Such a roof, if placed at an angle of from forty to forty-five degrees, and about nine feet high at the back, would afford a neat back walk, which would add much to the proprietor's comfort.

The chief point would be to take care that the compost and drainage are well managed at first; this secured, all other matters would be of but secondary importance.

Better to illustrate our plans for this mode of protecting and forwarding the growth of grapes on walls, we give the following sketch and references:—



A, The wall, which should be at least nine inches thick; if hollow, so much the better. B, The glass shelter—large panes, and the best glass is to be preferred. C, Moveable panes for ventilating. D, Upper ventilator. E, Back walk. F, Front wall, $4\frac{1}{2}$ inches thick, built on arches to allow the vine roots to pass into the outer part of the border. G G, Border, formed of compost. H H, Rubbly drainage. I, Main drain. K, Front walk. L, Bourbon roses, &c., which may be introduced occasionally.

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ERRATUM.

Page 43, line 12 from bottom, for " to cover in," read " to come in."

APRIL 1st,

Will be Published VOLUME the SECOND,

BY THE SAME EDITORS,

COMPLETING

THE GRAPE VINE:

ITS CULTURE, USES, AND HISTORY.

THE

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Edited by GEORGE W. JOHNSON, Esq.

Author of "The Dictionary of Modern Gardening," "The Gardeners' Almanack," &c.

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CONTENTS.

THE GRAPE VINE.

GREENHOUSE.

UNDER this head may be considered not only the modes of cultivating the grape vine in the same house with flowering plants, but also its cultivation in a vinery by itself, with a similar employment of heat only sufficient to exclude frost and other low temperatures at certain periods of the vine's growth. These periods are chiefly in early spring, when the occurrence of night frosts and easterly winds endanger the opening buds—and late in autumn, when cold damp weather may render a little artificial heat desirable, either to promote the ripening of the wood, or preserve from mouldiness the ripened fruit.

With regard to training, pruning, and thinning, in the greenhouse, they are fundamentally the same as in the stove (see next section), but with especial care on these points: 1. To train the vines to the rafters or otherwise, so that they shall not overshadow the interior before the end of May. 2. To empty the greenhouse of all greenhouse plants after that period, and to take every possible pains to get the wood ripe. You cannot have grapes without well-ripened wood. If grapes are very late in growing, they will require fire-heat in autumn, in many seasons, in order to ripen their wood. Vines and greenhouse plants do not agree very well; but under such a system they may be kept from quarrelling much. (*Johnson's Dict. Mod. Gardening*, 286.)

The most successful cultivator of the grape under glass, without the employment of heat, is Mr. Crawshay, of Colney Hatch; and the outline of his practice is thus traced by Dr. Lindley :—

The grapes are grown without the aid of fire-heat, so that the expense incurred is trifling; and, instead of having rich borders of several yards in width facing the vineries, and lying in a comparatively useless state, or looking unsightly with straw, the walks are allowed to run close up to the houses, with no preparation beneath of the ordinary soil, which is of a strong loamy texture. A border properly prepared would be better, but we merely state what Mr. Crawshay has effected without that powerful auxiliary. But what is yet more at variance with the opinion of many writers is, that the laps between the squares of glass, instead of being either close to each other, or filled with putty, are so far apart that in many places the finger can be inserted between the panes. This free ventilation, and having the floor of the vinery paved with common red flags or tiles, Mr. Crawshay considers to be most essential in growing grapes to perfection without the assistance of fire-heat. And there is no doubt that the excellence of the ventilation is most important. On entering one of his vineries with a south-west aspect, when the sun is shining full upon it, a refreshing air meets you, with the thermometer indicating a temperature of only 75 degs. The use of the paved floor is this: in the early stage of the vine's growth water is liberally thrown upon it to create vapour; and this treatment is continued until the berries are supposed to be stoned; after which it is gradually withheld; and when the colouring process commences, it is altogether discontinued; so that, by the time the grapes approach maturity, the floor becomes dry, and during the cool nights of autumn continues to give off slowly to the interior of the house the heat which it absorbs during the day. But there are other points in which Mr. Crawshay's treatment is peculiar. The stems of the vines are trained up the rafters about a yard apart. Every season the young wood is pruned back nearly close to the original stem, so that, even upon minute inspection, scarcely a bud is visible. This may be one reason why the wood is of such uniform size, not a single watery shoot being observable in any of the houses. After the pruning is completed, a free circulation of air is allowed, by means of the front sashes and top lights, and thus the breaking of the vines is considerably retarded; in fact, it is rendered later than upon the open walls. In general the vines do not begin to push until the latter part of April, and it is only in the first week of May that the houses are closed at night. Air is then admitted less freely during the day; the vines are frequently syringed, and abundance of water is thrown down upon the floors, to keep up a constant supply of moisture in the atmosphere. When the vines are in bloom, the houses are closed earlier in the afternoon, and the syringe is of course dispensed with, but is again made use of a few times after the grapes are thinned, to wash off the remains of dead flowers and dust, as well as to assist in restoring the leaves to their proper position. Air is then given more freely during the day, in wet as well as in dry weather; for, it is the opinion of Mr. Crawshay that the spots upon the grapes, commonly called "pitting," are caused by the stagnation of the atmosphere, which is consequent upon keeping a vinery closed for several days during wet weather. As we before stated, no water is admitted into the house after the colouring process has commenced, but abundance of air is left on through the night as well as during the day. Through the whole period of their growth no fire-heat is applied; but when the grapes are perfectly ripe, and the autumn frosts commence, an Arnott's stove is used to preserve the temperature of the house above the freezing point. Thus but a trifling expense is incurred beyond the bare attention necessary to ensure success; and the fruit so produced may, with care, be kept in perfection until February. It is fruit, too, of which every gardener might be proud. When the grapes are ripe air is admitted to the houses every morning between eight and nine o'clock: in fine weather, both in front and at the top; in rainy days, by means of the front sashes only. When a frost occurs of sufficient intensity to render the fire-heat necessary, just so much is applied as will keep the temperature of the house at 35 degs. (*Gard. Chron.* 1842, 603-739.)

Having been eye-witnesses of the great success of Mr. Crawshay's mode of vine-culture, which is of a very superior character, we may add our testimony to its complete success. One of the most striking features connected with Mr. Crawshay's system is the preference he gives to moderate-sized bunches over those of an overgrown character. This seems to be founded on the fact that small bunches, well thinned, will keep longer than very large ones. It must not, however, be inferred from this, that Mr. C.'s vines are not allowed to carry a good crop, for the reverse is the truth. At the time we saw them (1844), they were thoroughly cropped, from the bottom of the rafters to the top, scarcely a blank spot being to be found. Instead of a large bunch from a single spur, at a given point, there were in many cases two, or even three, shoots encouraged, each carrying a bunch of from half a pound to a pound in weight; so that, instead of one spur shoot, with a branch of $1\frac{1}{2}$ lbs., Mr. C. had two or three shoots with this amount of produce divided between them. Now this we consider a very excellent system for late grapes, as it will be found, we believe, that large branches do not possess such good keeping properties as those of moderate size; they are, moreover, more liable to shrinking or shrivelling. Another singular practice was related by Mr. Goodbrand (the gardener at that period), as being adopted by Mr. Crawhsay, viz., that when the bunches were what is technically termed "too large a show," in consequence of large shoulders, that such shoulders were systematically cut off: in fact, several of the shoulders had been recently cut away, and were lying on the floor. It must be borne in mind that Mr. C.'s aim is to produce well-ripened, late, autumn grapes, and to encourage keeping properties. To accomplish this, it is necessary to thin the berries more than usual.

Having grown very late grapes for many years, and with much success, Mr. Errington would offer as the results of his experience, that with regard to thinning the berries, it should be carried so far as that no two should touch when full swelled. Some who have not had experience in this matter may urge that the bunches will not "dish well"—and perhaps it is true that the Hamburghs may not lay quite so full on the dish—but this is amply compensated for by the superior character and keeping properties of the berries. He wishes also to lay the utmost stress on another and important object, viz., *ripening the wood*. Unless this principle is duly carried out, all appliances will be vain. This brings us to the subject of fire-heat, as connected with greenhouse culture. In offering advice on this head, we must leave out of the question the use of fire-heat applied for the sake of pot plants, which are frequently cultivated under the vines. In such cases a compromise of course takes place; and, we need scarcely add, some sacrifice must be endured.

It was stated, at the time Mr. Crawshay's mode of culture so much occupied the public attention, that Mr. C. never used fire-heat. At that period, we have been informed, he indeed used very little. From subsequent information, we are led to think that Mr. C. has somewhat increased the use of artificial heat; in fact, to do justice to the keeping of late grapes, it cannot be entirely dispensed with: it may in spring and summer, but when the damp autumn months arrive it must be had recourse to. In a bad summer, artificial heat will, moreover, become necessary at the end of September, for awhile, to complete the ripening process ; for, in all cases, grapes to hang well, should be perfectly ripe by the end of September. It is a complete fallacy to imagine that retarding their ripening after that period will conduce to their long keeping.

We have already stated that Mr. Crawshay is a great advocate for thorough ventilation : his houses are the very reverse of a "Ward's case." There has, in our opinion, rather too much stress been laid upon having a draught in hothouses. Certainly no man in his senses would invite a cold or frosty wind ; and here arises the question, as to whether motion is really necessary in the air of hothouses? We are of opinion that it is by far more essential to the health of plants in general—more especially fruits—than people commonly imagine. We anticipate the time when it will be deemed necessary to keep up a ventilation, or rather *circulation*, night and day ; indeed, this is Mr. Errington's practice at the present time. The scalding in the berry, as it is termed, most commonly proceeds from the neglect of early ventilation. If the atmosphere is charged abundantly with moisture, and the sun breaks out rather suddenly in a May or June morning, this will speedily occur. Some of the best vine-growers we know have made a point of giving air, if only in the most trifling degree, by six o'clock in the morning, during the months before alluded to : that is to say, they allowed the confined damp and stagnant air to escape at the back, and promote an ingress of fresh air from the front of the house.

With regard to keeping grapes long on the tree, much depends on the selection of the kinds. The two best for this purpose are, undoubtedly, the true Black Hambro' and the true West's St. Peter's. We imagine the latter to be synonymous with the Black Lombardy, or Raisin des Carmes, of the Horticultural Society's catalogue. Of this, however, we are not perfectly assured, as there are two or three grapes called St. Peter's. The kind we mean has rather slender wood; the lobes of the leaf are rather obtuse, or not well defined; and one peculiarity is, that the leaf turns as red as the old Virginian Creeper, in the month of November. This is an invaluable grape, and should be in every collection; it is, moreover, exceedingly prolific, and particularly adapted for the "close spur" system recommended by Mr. Crawshay.

The Black Hambro' is too well known to need a description here: this, for general utility, may be placed at the head of useful grapes, and is equally adapted for late or early purposes. The Muscat of Alexandria is also a fine late grape, but will not submit to the low temperature and degree of atmospheric moisture which the Hambro' and West's St. Peter's will endure. It should by all means have a smal house to itself, and would require a good deal of fire-heat, with a free ventilation, in November and December.

In cultivating plants in pots under vines, two or three points deserve consideration. In the first place, the pots should be at all times placed very thinly; any attempt at crowding them will assuredly defeat the end in view. Those tribes also should be encouraged, chiefly, which require very little water in October and November. The Cape Bulbs, the Achimenes, the Cacti, &c. are somewhat eligible for this purpose. Particular attention should be paid to an almost constant ventilation, as before urged.

STOVE CULTURE

THE vinery is very variously constructed, both as regards form and material. It is built round, square, and parallelogram, with wood or iron for the rafters, and with flues, steam, hot water, and warmed air, as the sources of artificial heat. It will enable us to be more explicit if we consider each part of the structure separately.

But before proceeding to discuss the merits or demerits of the various structures, we would offer a few remarks on the vast importance of the greatest possible amount of light. The great improvement that has taken place in the manufacture of glass, together with much improved and more natural mode of management in regard to the atmosphere of hothouses, as now practised by our best gardeners, augurs well for vine forcing in future years. Indeed, we see no reason why good grapes may not be obtained the whole year round: for, as before stated, the imperfect admission of light through bad glass, the frequency of laps, together with clumsy and heavy structures, constituted the main obstacle under the old system, more especially with regard to early forcing.

With all deference to the opinion of the late T. A. Knight, who recommends 34 degs. for the angle of the forcing-house, we are inclined to think that what is termed by workmen the "mitre angle," or 45 deg., will be found quite as eligible for general purposes. It will be found, we think, that the internal arrangements will in general be carried out with greater ease.

The next great point to secure is a permanency of atmospheric moisture under a perfect control. So many plans for this purpose are adopted that it is somewhat difficult to recommend any particular mode as superior to the rest. One mode, however, we would protest against, which is, the producing a sudden cloud of steam by pouring water on hot flues or pipes. This is by no means so congenial to vegetation as is commonly supposed. Atmospheric moisture thus produced, certainly cannot be considered a proper imitation of the ground vapour in tropical climates, inasmuch as the soil under those circumstances will not in general be much above 90 or 100 degs.

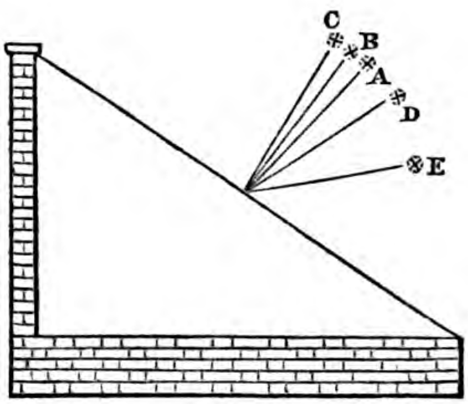
And here it is that we fear the Polmaise system may prove in part a failure, for with the great increase of heat will be required a corresponding increase of atmospheric moisture, otherwise vegetation will be plundered. It remains to be seen, therefore, whether this amount of moisture will not prove too great for general purposes, and whether it be of a healthy character.

The best and most simple mode with which we are acquainted is to provide a cemented gutter in front of the house ; at least, where hot-water pipes are used. We have had this mode in use for three years, and find it perfectly satisfactory. The bottom or return pipe rests on the bottom of this trench or gutter, and by having a tap with a short leaden pipe fixed at the furthest end of the house, together with a reservoir which feeds the boiler at a higher level than the tap, the bottom or return pipe, whenever necessary, can be covered with water in less than half an hour. Now the return pipe, as is well known, is of a lower temperature than the flow or advance pipe, and the amount of atmospheric moisture thus produced, is sufficient for any tribe in cultivation. In fact, it is seldom the full powers of this mode of producing moisture are put in requisition. By admitting the cold or fresh air at the lowest level, in fact immediately over the piping, the moist air becomes condensed, and instead of proceeding to the roof to form drip, passes at a low level through the body of the house.

One caution is necessary here, at least with regard to vines, and that is to empty the gutter the first thing every morning, for fear of scorching or blistering the vines. This may be easily effected by having a tap or plug at one end, and communicating immediately with the main vine-border drain; and by pulling out the plug the gutter will be emptied in a few minutes. This mode is far preferable to the open gutter, inasmuch as it is under the most perfect control, without the trouble of moving covers.

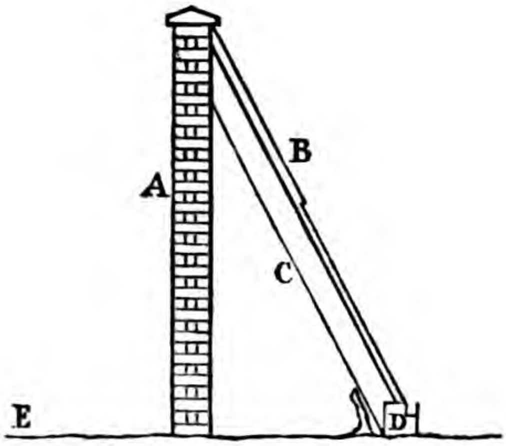
Glass.—This should be of the best manufacture, for just in proportion to its goodness of quality is the freedom with which the rays of light pass through, and a plant performs its digestive and assimilating processes the nearer to the vigour with which it effects them in a state of nature, just in proportion as the light it basks in is similar to that of its native habitat. But this is not the only reason why good glass should be employed in our garden structures; for whilst panes of common crown glass readily break from frost or the slightest twist of the wood-work, good sheet glass will remain uninjured by much greater violence and by the fiercest hailstorms. Some injury from the last, however, will always arise, and this leads me to observe, that no one having green-houses or stoves should fail to have them insured by the "Hailstorm Insurance Company." Good glass is of little value unless kept clean, and for this purpose it should be cleansed on both sides twice annually, early in February and October, and on the outside only in June.

The angle formed by the glass roof of the hothouse is of very considerable importance, because rays of light are reflected in proportion to the obliquity with which they fall upon any given surface; those which fall upon it perpendicularly from the source of light pass through with very slight diminution, but those falling upon it in a slanting or oblique direction are reduced in number in proportion to the obliquity of that direction. To ascertain how a glass roof may be constructed, so as to receive the greatest number of rays of light from the sun perpendicularly, or near to perpendicularity at any given time of the year, it is necessary to know the latitude of the place where the hothouse is erected, and the sun's declination at the period when most light is required. The latter information may be obtained from most almanacks, and if it be subtracted from the latitude, the remainder will be the angle desired. If London be the place, and May the 6th the time about when the most light is desired, the latitude being 51 degs. 31 min., and the sun's declension then 16 degs. 36 min. north, therefore the roof ought to slope at an angle of 34 degs. 55 min.



In latitude 52 degs., Mr. Knight found from lengthened experiments, that the best angle is about 34 degs., considering the services of a hothouse through the year; and to illustrate this, he gave the preceding diagram. About the middle of May, the elevation of the sun at noon corresponds nearly with the asterisk, A; in the begining of June, and early in July, it will be vertical at B, and at midsummer at C, only six degrees from being vertical. The asterisk, D, points out its position at the equinoxes, and E its position at midwinter. If the best glass be employed, it is an excellent plan to have it put double in each sash, an interval of half an inch being left between the two panes, and a small hole at the corner of the inner one to prevent the glass being broken by the expansion or contraction of the air between. This confined air is one of the worst possible conductors of heat, keeping the house from being rapidly cooled during even the coldest weather. (*Johnson's Princ. of Gardening.*)

In conformity with the foregoing principles, Mr. Saul, of Castle Hill, Lancaster, has given the accompanying section of a vinery, as the form best suited for keeping late grapes. The great superiority which a house of this construction has over the old form is, first, that by the nearly upright position of the glass, scarcely any of the rays of the sun are lost; while, for the same reason, scarcely a drop of wet can find its way into the house. Another recommendation for this plan is, the small space to be heated; consequently the temperature can the more readily be raised to any degree required. This kind of house will also be the very best for early forcing, as, from the small space to be heated, one boiler placed in the centre would be quite sufficient for heating a house of 150 feet in length. This kind of structure differs very little from that recommended by the late Mr Atkinson, except in the more upright position of the sashes; and probably the method of ventilation adopted by Mr. Atkinson would be found the best. The upper sashes could, however, be made to slide up and down, if necessary.



A, back wall; B, rafters; C, trellis upon which the vines are trained which are planted inside; D, parapet wall upon which the sashes rest at bottom; E, ground level. (*Gard. Chron.* 1842, 22.)

How important is the provision of the greatest possible amount of light to our forced plants is known to every gardener, from the fact that in proportion to the deficiency of light does the plant under glass become, in the gardener's phraseology, *drawn*. That is, its surface of leaves becomes unnaturally extended, in the vain effort to have a sufficient elaboration of the sap effected by means of a large surface exposed to a diminished light, for which a less surface would have been sufficient if the light were more intense. The plant with this enlarged surface of leaves becomes unfruitful, the sap being expended in their production, which should have been appropriated to the formation of fruit.

Mr. Williams made some experiments intended to illustrate this point, and he found that varieties of the vine, when grown under white, or crown glass, under green glass, and in the open air, had the diameters of their leaves, in inches, altered as in the following table :—

Name.	White.	Green.	Open Air.
White Muscat........	8	12	7
Malmsey Muscadine ..	6½	12	6
Syrian	8	14½	
White Sweet Water....	6	9	6
Black Hamburgh......	8	13½	
White Frontignac	6	11	6
White Muscadine......	6	11	6

Glazing, or the mode in which the glass is inserted in the frames, is a very important consideration ; for if done imperfectly, moisture from rain, dew, or vapour condensed within the house, penetrates between the rebate of the framework and the glass, or between the laps of the panes themselves, and, expanding in the act of freezing, unfailingly cracks them. Again, if the panes fit tightly into the rebates, any sudden expansion causes a similar fracture.

We are of opinion that panes of glass seven inches wide and twelve inches long are the best practical size for hothouses. The glass should be clear, stout, and selected as flat as possible, so that the panes may lie perfectly level one upon the other, and so cut that they may not fit too tightly against the ribs (which is frequently practised by some glaziers), but room should be left for the ribs to swell and expand. Before a light is glazed, all the panes should be laid in loose, to see that they fit easy and are quite level, as well as range one with the other; when that is done, the panes must be taken out, and some well worked putty laid in the rebate; the panes must then be replaced and pressed firmly down, and the bottom frame bedded in the putty, so as not to leave a vacancy. When the glass is bedded in the putty along the astragals, the usual way is to 'front putty' the whole at once; but at Kew, the lights are put by after the glass is bedded till the bedding putty is dry. The astragal then gets a coat of paint, and also a strip of the glass, the depth of the bedding on the astragal, and when this is dry the front putty is put on. The coat of paint on the glass will cause the front putty to adhere to the glass, and it will remain sound many years longer than when it is put on without this precaution. This is a capital contrivance for lights that slide up and down; but for lights that are fixed, the best way is to have no front putty at all. Instead of overlapping the panes, as is done in the ordinary way, cause the glazier to cut each with a perfectly straight edge, and then to place them one before the other, so that they shall all fit exactly. When the light is completed, the surface of the glass is perfectly level, and there are no interstices in which the dust, &c., can accumulate, or for the deposit of moisture. By this means one cause of considerahle breakage in frosty weather is entirely avoided ; and if a pane of glass is accidentally broken, as each pane is independent of the others, the fracture does not extend beyond the single pane. The whole is very firm and compact, and the glass is not liable to shake out, as frequently occurs in opening and shutting sashes. (*Gard. Chron.*)

If lapping be permitted, its width should not exceed one-eighth of an inch, and the panes should be acutely rhomboid, to throw the condensed vapour down to the lower corner, and induce it to trickle down the bars instead of dropping. It is very doubtful whether it reduces the amount of moisture taken between the laps by capillary attraction. (*Johnson's Mod. Gard. Dict.* 617.)

Instead of lapping, as glass is fractured during frost, owing to moisture freezing between the laps of the panes themselves, or between metal laps and the glass, it is advisable, as before recommended, to do away with all laps. The edges of the panes may be cut accurately rectangular, and wetted with liquid putty before being placed in contact, and the join resting upon flat narrow bars of iron passing the whole length of the house. The bars across the breadth of the roof need be very few, being only required to render the others firm.

Roof.—The framework of this may be of iron or of wood, and the comparative merits of the two materials are thus fairly stated by Dr. Lindley. The advantage of iron roofs for hothouses are, that they are more durable than wood, and allow a far greater quantity of light to pass through them than wooden roofs, the difference being as 7 to 28, or even 30, in favour of iron, and this is a most important property, when we consider that the healthy action of plants is in proportion to the quantity of light which reaches them. The disadvantages of such roofs are, that they rapidly heat, and as quickly cool down. They are therefore liable to sudden changes of temperature, which can only be guarded against by great attention, which is expensive, and by a large consumption of fuel. We should say use iron, if you prefer success and beautiful form, to cost, and can rely upon the attention of your people; but employ wood, if you are obliged to study economy. (*Gard. Chron.*)

Heating.—Flues, for imparting heat to hothouses, are for the most part superseded by either tanks or hot-water pipes; but where retained, the top should be formed of iron plates, these admitting the heat most readily into the house, and consequently requiring a less consumption of fuel. If it be desirable to have a covering for the flues that will retain the heat longer, as when the fires are made up at night, this may be readily accomplished by putting a row of the thick square paving tiles on the top of the whole length of the flue, an hour or two before the houses are finally closed.

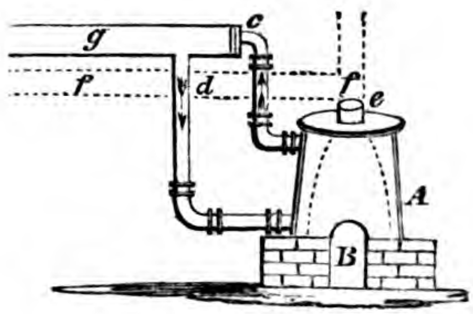
Flues are best built of bricks set on their edges, and the top formed of a shallow iron trough for the purpose of holding water, and thus keeping the air moist as required. At night, for retaining heat, pantiles may be placed along within the trough. The best form is the annexed.

Hot Water in Tanks.—It is a law of fluids that their hottest portions rise to the surface of the containing vessel, and the coldest portions as invariably subside to the lowest surface, because heat makes them expand, and consequently diminishes their specific gravity; and the abstraction of heat makes them contract, and as consequently increase that gravity. When the boiler and tank are filled with water, as well as their connecting pipes, and a fire is lighted, the hottest portions rise to the top, flow along the surface, and getting cool, sink to its bottom, and passing downward enter again at the lower part, to be once more heated, and pass through the same circulatory system. A very small boiler will speedily raise the heat of the water, in a very large tank, to 180 degs.; and if this heat be imparted late in the evening, it will retain its heat but little diminished until the morning. The smoke, by means of a flue, may be made to impart heat to the house, by passing through it, or may at once enter the chimney or pipe attached to the summit of the boiler.

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 their 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 19*s.* 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, as well as for the next, 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 either to ascend the chimney at once, or to pass round the house.



Hot-water in open Gutters.—Mr. Griffin, gardener to Mrs. Wells, of Cowley, near Exeter, has published the following remarks upon this mode of circulating hot-water.

The open trough, or gutter, may be applied to a boiler of any construction. The water flows from the top of the boiler, through a four-inch pipe, into troughs made of cast iron, of the following dimensions: inside measure six inches wide at the top, three inches and a half at the bottom, and seven inches deep; the trough is constructed in lengths three feet long, neatly fitted together by a rivet in the bottom, and one on each side near the top. The water returns in a cast iron pipe, three inches in diameter. There are thin iron lids or covers, of the same length at each portion of the trough, to fit upon the whole length of the apparatus, so that the degree of humidity may be regulated by making up some portions of the covers, without disturbing the others. The troughs or gutters might be made of various materials, but Mr. Griffin prefers iron. The heat is diffused from the surface of the trough or pipes, nearly as quickly as it would be from copper or zinc, and retains the heat much longer. The width and depth of the troughs should be varied according to the plants intended to be grown in the house. An orchidaceous house requires a wider surface on the top than those intended for the growth of ericæ and greenhouse plants generally. During the resting season of orchidaceous plants, the atmosphere of the house is easily kept less humid, by not removing the whole or any part of the lids.

For vineries and peach-houses, it would answer exceedingly well, and entirely eradicate the red spider; for the trough can be covered when the trees are in flower, and when the fruit is approaching towards maturity. On the other hand, during the growing season you may maintain a regularly humid atmosphere with less trouble than by any other means. In a pine-stove, forty feet long, with a walk between the back wall and bark bed, the trough being two feet from the level of the walk, Mr. Griffin says, 'I can command any degree of heat with much less attention than is required for some houses with a boiler of the same description and equal power as regards pipe.' (*Gard. Chron.*)

Heating by Steam.—If this be employed, Mr. Tredgold has given the following rules for calculating the surface of pipe, the size of the boiler, the quantity of fuel, and the quantity of ventilation, required for a house thirty feet long, twelve feet wide, with the glass roof eight feet, length of the rafters fourteen feet, height of the back wall fifteen feet. The surface of glass in this house will be seven hundred and twenty feet superficial, viz., five hundred and forty feet in the front and roof, and one hundred and eighty feet in the ends. Now, half the vertical height, seven feet six inches, multiplied by the length in feet, and added to one and a half time the area of glass in feet, is equal to the cubic feet of air to be warmed in each minute when there are no double doors.

That is, 7.5 multiplied by 30 added to $1\frac{1}{2}$, multiplied by 720=1305 cubic feet. But in a house with wooden bars and rafters, about one tenth of this space will be occupied with woodwork, which is so slow a conductor of heat, that it will not suffer a sensible quantity to escape, therefore 130 feet may be deducted, leaving the quantity to be warmed per minute=1175 cubic feet.

To ascertain the surface of pipe required to warm any given quantity of air, multiply the cubic feet of air to be heated per minute by the difference between the temperature the house is to be kept at, and that of the external air in degrees of Fahrenheit's thermometer, and divide the product by 2.1, the difference between 200, which is the temperature of the steam pipes, and the temperature of the house; the quotient will be the surface of cast-iron pipe required.

Now, in the house, the dimensions of which are above given, if the lowest temperature in the night be fixed at 50 degs., and 10 degs. are allowed for winds, and the external air is supposed to be at zero or 0 of Fahrenheit, then 1175 multiplied by 60 degs. and the product divided by 2.1, the difference between

200 and 60, will give us the quotient 236 = to the surface of pipe required. Now the house being thirty feet long, five pipes of that length, and five inches in diameter, will be about the proper quantity.

If hot water be employed instead of steam, the following proportions and information, obtained from Mr. Rendle, may be adopted confidently as guides. In a span roof propagating house, forty feet long, thirteen feet broad, seven feet high in the centre, and four feet high at the two fronts, having a superficial surface of glass amounting to 538 square feet, Mr. Rendle has a tank of eighty-three feet long, running round three sides of the house, four feet wide and about eight inches deep, and consequently capable of containing nearly 300 cubic feet of hot water, though only half that quantity is used. This is closely approaching to the size pointed out, according to Mr. Tredgold's formula. The mean temperature of a hot-water tank will never be much above 100 degs., so that for the sized house mentioned by that skilful engineer, the divisor must be 2.1 times the difference between 100 and 60 degs., which gives as the quotient 335 cubic feet.

The tank in Mr. Rendle's propagating house is lined with Roman cement, and if the temperature at the time of lighting the fire be 90 degrees, the temperature of the atmosphere of the house 67 degrees, and the temperature out of doors 50 degs., the quantity of small coal or breeze required to raise the temperature of the water to 125 degs. is 28 pounds. In twelve hours the water cools, after the fire has been extinguished, from 125 to 93 degs.

When steam is employed, the space for steam in the boiler is easily found by multiplying the length of the pipe in feet, by the quantity of steam in a foot in length of the pipe.

Interior diameter of pipe in inches.	Decimal parts of a cubic foot of steam in each foot of pipe.
1	0.0545
1½	0.1225
2	0.2185
2½	0.34
3	0.49
4	0.873
5	1.063
6	1.964
7	2.67
8	3.49
9	4.42
10	5.45

In the above noticed house, the length of pipe five inches in diameter is 150 feet; and these multiplied by 1.363=20.5 cubic feet of steam, and as the pipe will condense the steam of about one cubic foot and one third of water per hour, therefore the boiler should be capable of evaporating $1\frac{1}{2}$ cubic feet of water per hour, to allow for unavoidable loss. In the extreme case of the thermometer being at zero, the consumption of coals to keep up this evaporation will be $12\frac{3}{4}$ pounds per hour.

These calculations are all founded upon the supposition that the condensed water is returned to the boiler whilst hot; but if this cannot be effected, then one twelfth more fuel will be required. The boiler for the supply either of steam or hot water, should be covered with the best available non-conductor of heat; and this is either charcoal or sand.

A case of brickwork, with pulverized charcoal, between this and the boiler, is to be preferred to any other. A boiler having a surface of seventy feet exposed to the air, in a temperature of 32 degs., requires an extra bushel of coals to be consumed per day, to compensate for the heat radiated and conducted from that surface; and the smaller the boiler, the greater is the proportionate waste. The surface of the pipes should be painted black, because a surface of this colour gives out more heat in a given time than any other. (*Johnson's Principles of Gardening.*)

In heating by hot water there are some practical questions which gardeners require to have answered, but to do which neither the country ironmonger nor country builder is usually qualified. One of these questions very usually is, "How large ought the boiler to be to keep these pipes hot?" Now, the total size of the boiler really has nothing to do with the question; indeed, the smaller it is, the better, provided *a sufficient surface of it can be exposed to the fire.*

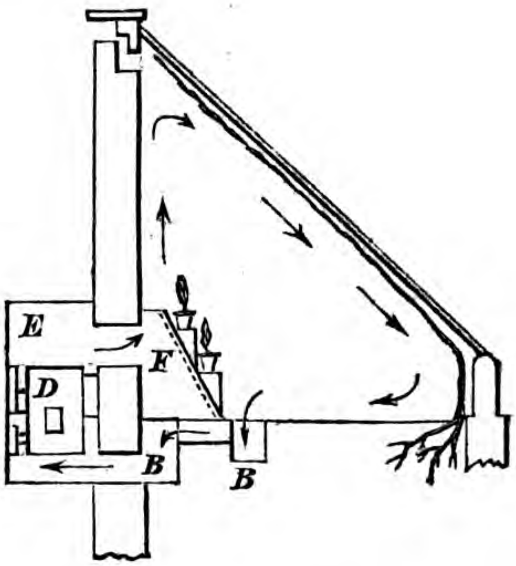
Mr. Hood furnishes the following useful table, showing the amount of boiler surface which must be exposed to the fire to heat given lengths of pipe, respectively 4 inches, 3 inches, and 2 inches in diameter.

Surface of Boiler exposed to the fire.	4 in. pipe.	3 in. pipe.	2 in. pipe.
	ft.	ft.	ft.
$3\frac{1}{2}$ sq. feet will heat	200	or 266	or 400
$5\frac{1}{2}$	300	400	600
7	400	533	800
$8\frac{1}{2}$	500	666	1000
12	700	933	1400
17	1000	1333	2000

—(*Johnson's Mod. Gard. Dict.*)

Heating by Hot Air.—Every system of heating is more or less founded upon the fact that, if a hot body be introduced into an enclosed room, the air in contact with that body becomes lighter, and rises as it is heated, is cooled and becomes heavier when it reaches the upper part of the room, and consequently sinks down to be again heated by coming in contact with the hot body, and thus is kept in perpetual circulation. This is the principle upon which all heating is founded; yet no one, that we are aware of, ever thought of making the air circulate at once over, and be heated by the furnace direct, as suggested by Mr. Murray, head gardener at Polmaise, and thence designated the *Polmaise* system. Other persons have always employed flues, or pipes, or tanks, heated by a distant fire, to communicate the desired warmth.

Mr. Murray deserves great thanks from horticulturists for the publication of his cheap mode of heating hothouses. His system is an adaptation of long known scientific facts to a useful purpose; and its success, like that of Mr. Rendle's system, depends upon the constant circulation of a heated fluid, rising as it is heated, and sinking down as it cools to be heated again. The difference is, that Mr. Murray's fluid is the atmospheric air of the house, and Mr. Rendle's is water. The great merit of using air is, that it does not require an expensive tank or arrangement of pipes.



In the above sketch of a lean-to house, B is the drain or underground flue, conducting the cooled air to the heating stove, D; E is the warm air chamber; F, a woollen cloth or blanket fastened over the orifice admitting the warmed air into the house. This blanket is kept moist by means of skeins of worsted, having one of their ends dipping in water, and the other end touching the blanket. The arrows show the currents of rising and descending air. But this structure has since been much improved upon, and the following, erected by Mr. Meeks, is the most perfect hitherto promulged. The furnace, bricks, &c. cost less than £19, and there is no doubt that no expense was spared in this model erection. We are indebted to the *Gardener's Chronicle* for the following plans and details.

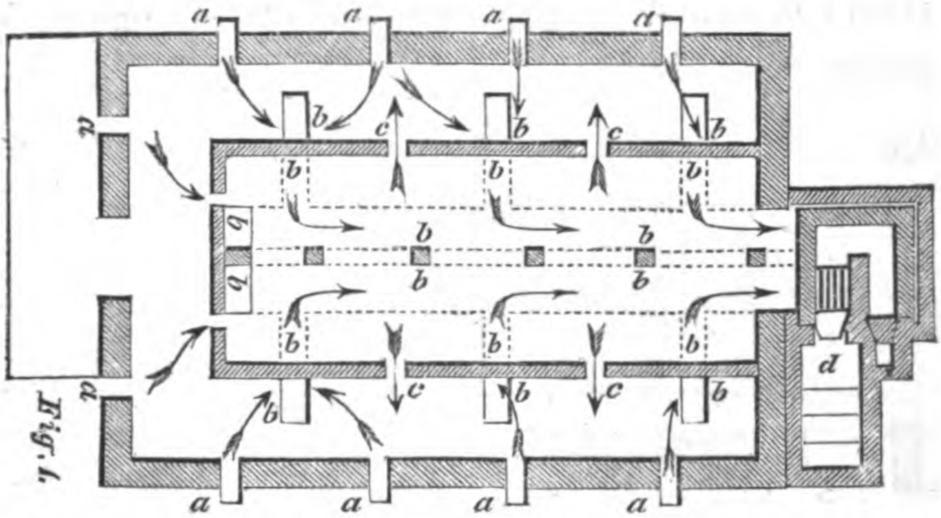


Fig. 1.

Fig. 1. Plan of house, showing cold air entrances, cold air drains, hot air chamber, and entrances for air into the house, with furnace, chimney, and direction of currents; *a, a,* cold air entrances, covered at pleasure with a horizontal lid outside the house; *b, b,* cold air drains, covered at pleasure with sliding covers made of slate; *c, c,* entrances for hot air into the house, which may likewise be covered at pleasure with doors sliding along the face of the pit; *d,* the furnace.

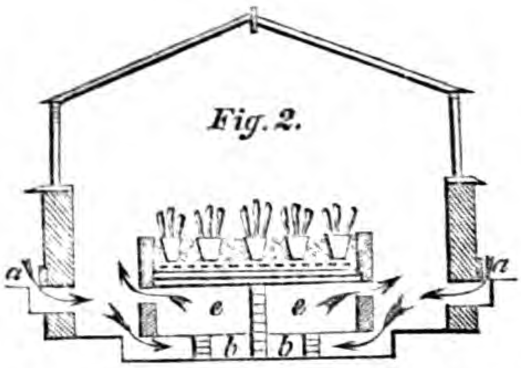


Fig. 2. Section of house, showing bottom heat chamber, cold air drains, and direction of the currents; *a*, entrance for cold air; *b*, cold air drains; *e*, bottom heat chamber.

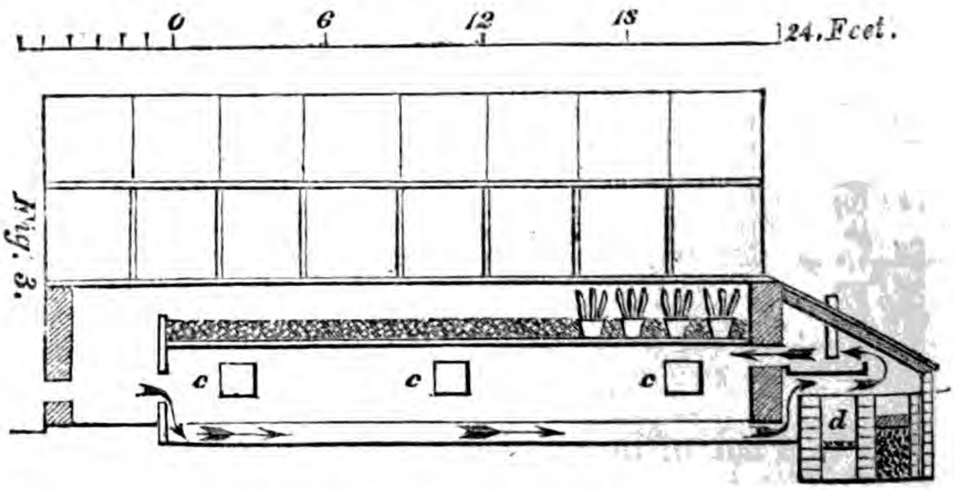


Fig. 3. Longitudinal section of house, showing hot air chamber, furnace built of Stourbridge brick, and surrounded with two inches of sand, and covered over with a half-inch iron plate in three widths; the cistern is made of iron, four inches deep, in two divisions, and fed through a pipe from above; the roof has a cavity to be filled with sawdust, to prevent the escape of heat; *c*, entrance for hot air; *d*, furnace.

Ventilation.—The accumulation of gaseous matters, such as sulphurous acid and ammonia, and the consumption of carbonic acid, render ventilation essential to the health of vines, and of all plants in hothouses. They cannot inhale air overloaded with these contaminations without being speedily injured, and the proportions of those gases which rapidly cause disease or even death, are much less than the gardener usually suspects; for if the sulphurous acid amounts to no more than one cubic foot in ten thousand of the air in a hothouse, it will destroy most of its inhabitants in two days. To avoid such destruction, for the comfort of visitors, and above all for the sake of the plants' vigour, air should be admited as freely as the temperature will permit. The foul warm air can be easily allowed to escape through ventilators in the most elevated parts of the roof, and fresh warm air can be as readily supplied through pipes made to enter near the flooring of the house after passing through hot water, or other source of heat.

We are quite aware that Mr. Knight has stated that he paid little attention to ventilation, and that plants will be vigorous for a time in Wardian cases; but this does not prove that their Creator made a mistake when he placed vegetables in the open air.

Plants confined in houses or other close structures, may be made to grow in spite of such confinement; but all experience proves that other favourable circumstances, such as heat, light, and moisture, being equal, those plants are most vigorous and healthy which have the most liberal supply of air. — Those who doubt the propriety of an almost constant ventilation will, by referring to the description of Mr. Crawshay's houses, as described by Dr. Lindley, find that very much of Mr. C.'s success is imputed to the circumstance of open laps. It has been said that, shut up a house how we will, there is still a circulation, and undoubtedly there is; but is it sufficient? For, after all, how different the sensation between breathing in a shut-up house and in the open air. So important do we consider ventilation that we use it night and day on all possible occasions. It must be remembered, however, that a very small ingress and egress is sufficient where there is so great a disparity of temperature between the outer and inner atmospheres. One great desideratum remains to be accomplished in this respect, and that is to circulate and promote motion in the atmosphere, and avoid unnecessary extremes of heat, without dissipating the atmospheric moisture. All new modes of heating should, in combination with the question of economy, combine this most important consideration.

There have been many modes suggested for self-acting ventilators, descriptions of which may be found in Loudon's *Encyclopædia of Gardening*, and the *Transactions of the London Horticultural Society;* but there are none that can supersede the gardener's personal care, directed by the thermometer and experience.

The practice of all ventilation is founded on the principle that the hottest air rises to the highest part of the house, and if there allowed to escape, colder air will come in below to supply its place. To prevent the hot air escaping too rapidly, the ventilators should be fitted with doors or caps, capable of regulating the size of the orifice; and the openings admitting fresh and colder from without, should have similar regulators, and be made by means of pipes passing through the bark-bed, tank of hot water, or other source of heat, so that the reduction of temperature be not too rapid.

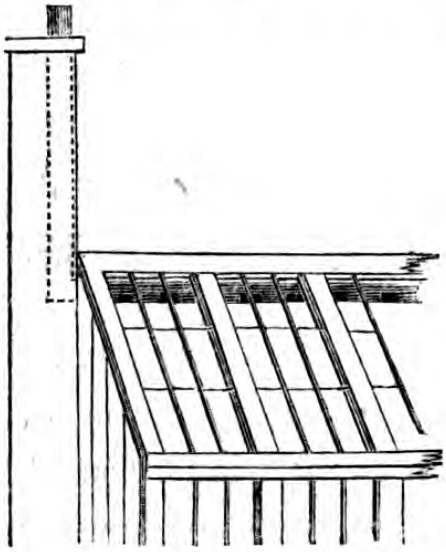
Some guide in constructing ventilators proportioned to the size of the house to be ventilated, will be found in Mr. Hood's following table of the quantity of air, in cubic feet, discharged per minute through a ventilator, of which the area is one square foot.

Height of ventilator in feet.	Difference between temperature of room and external air.					
	5 deg.	10 deg.	15 deg.	20 deg.	25 deg.	30 deg.
10	116	164	200	235	260	284
15	142	202	245	284	318	348
20	164	232	285	330	368	404
25	184	260	318	368	410	450
30	201	284	347	403	450	493
35	218	306	376	436	486	521
40	235	329	403	465	518	570
45	248	348	427	493	551	605
50	260	367	450	518	579	635

The foregoing table shows the discharge, through a ventilator of any height, and for any difference of temperature. Thus, suppose the height of the ventilator from the floor of the room to the extreme point of discharge to be thirty feet, and the difference between the temperature of the room and of the external air to be 15 degs., then the discharge through a ventilator one foot square will be 347 cubic feet per minute. If the height be forty feet, and the difference of temperature 20 degs., then the discharge will be 465 cubic feet per minute.

The best form of a ventilator would be a zinc tube about 9 inches in diameter, placed along withinside at the highest point of the house, with openings beneath, and the tube elongated and continued up within the chimney of the fire heating the stove, or any other chimney in its vicinity, as in the following sketch.

The law which regulates the operation of such a tube is this: When equal *bulks* of two fluids are put into the opposite limbs of a syphon, the lighter fluid is forced upwards with a velocity equal to the velocity which a solid body would acquire in falling, by its own gravity, through a space equal to the additional height which the lighter body would occupy in the syphon, supposing a similar *weight* of each fluid had been used. This velocity is easily calculated: a gravitating body falls 16 feet in the first second of time of its descent: 64 feet in two seconds, and so on, the velocity increasing as the square of the time; therefore, the relative velocities are, as the *square roots of the heights.*—(*Hood on Ventilation*, p. 31.)



Now, in the pipe sketched above, the total height from the floor of the stove to the point of final escape of the heated air, is the height of the syphon. The force of motion is the difference of weight between the column of heated air and that of a column of the external air of the same height. Now air expands when heated 1-480th of its bulk for each degree of Fahrenheit's thermometer, and the velocity of motion is equal to the additional height which a given weight of heated air must have in order to balance the same weight of cold air; therefore, the higher the tube in the chimney, and the hotter the air is kept in it, the greater the velocity of ventilation.

The passage of air may be regulated by a slide to pass through a cut in the pipe just within the house, and close to the end next the chimney. (*Johnson's Gardener's Almanack*, 1847.)

Borders.—These should be formed inside the house and eight or ten feet wide. They should be of the same materials recommended for vines upon the open walls, and with quite as much attention to their drainage; and the walls being built upon arches, a similar breadth of border made in every respect similar should be on the outside.

Loam, of a somewhat more tenacious character, however, should be used for inside borders, than for outside ones, as there is no fear of their becoming "soured" unless through injudicious watering.

In making borders inside the building, which are far more preferable to the outside for early forcing, care should be taken not to bring the roots in contact with very hot flues or pipes; when the border is of necessity brought close to them, some non-conducting body, as wood, should be interposed. An enclosed body of new and dry sawdust would be found, perhaps, superior to anything else, provided it could be kept dry.

When the borders must of necessity be outside, it is of the utmost importance to endeavour to preserve the accumulated warmth of summer. To this end, the top-dressings necessary should be laid on betimes. For a house to ripen grapes in May, it might be applied as early as September. The top-dressing should be composed of coarse and open materials, and should be placed a considerable depth, finishing at top with clean straw or fern of some thickness; and if this could be so disposed as to carry off the moisture, it would be a great advantage, as there is little doubt that the border will have moisture enough: the main business is to avoid excess. Such a covering as a tarpaulin would be of great service in this case: it might be supported on spars, to avoid close contact. Some of our best gardeners increase this covering just before they commence forcing; and, by the addition of fermenting materials, endeavour to produce a temperature in the mass of 80 or 90 degrees.

This amount of heat has startled some persons, who do not sufficiently consider that, through the tendency of heat to ascend, the volume of the border in the vicinity of the roots is perhaps not above 60 or 65 degrees. This cannot be too much, if it be admitted that warmth of root is necessary to excite the vital forces, and that without such action the vine will have to exist entirely on the accumulated stores of former years. Care must be taken to remove such covering in due time—not, however, entirely. Mr. Roberts' directions are excellent on this head, and may be implicitly followed.

Although we join with our best practical gardeners in recommending the roots of early-forcing vines to be kept in the house; yet, when circumstances are favourable, there can be no possible harm in throwing the front wall on arches, and allowing a portion of the roots to go outside. When such is the case, however, a protecting process ought to be carefully pursued, or some derangement in the reciprocal balance which ought to exist between root and branch may ensue. It is, at least, well to provide against it.

There scarcely needs more to be said on the construction of the borders than has been already, but, as is truly said by Mr. T. Appleby, gardener at the Fence, near Macclesfield—

Unless this is properly done, however excellent the internal management, however good the construction of the house, and however well it may be heated, if the vine is not right at the root, all the expense, labour, and attention, will end in disappointment. We shall, therefore, give this gentleman's directions, as well as those of Mr. Roberts, and of some other modern and first authorities. The site of the vinery should, if possible, be neither too high nor too low; though, of the two, an elevated situation is to be preferred. But whatever the situation is, the border must be well and effectually drained. If the situation of the vinery is in a flat country, the front wall ought to be as high as the border is deep. In this case take off only the surface spit of the soil, that is about nine inches; but should the situation be elevated, take out as much more, the object being to raise the border above the natural level of the surrounding soil; but this is not so requisite in a high situation as in a low one. The width of the border need not be more than 20 feet, and should not be less than 15 feet. It is a good general rule to have the border the same width as the houses. The width of the border being determined, and the soil removed, the top spit, if it be good, may be mixed with the compost; then slope the bottom with a gentle descent from the houses, making it pretty firm. This is the floor of the border. At the extreme edge build an open drain, extending six inches below the level of the floor and six inches above it, by one foot wide. The sides to be built in the pigeon-hole manner, to allow a ready passage for the superfluous water. Have this floor paved with strong slates or thin flags, and then covered all over with broken stones or brick ends, about the size of a man's fist. When these are levelled, cover them either with small twigs, bean-straw, or thin turf, laid with the grassy side downward. This is to prevent the soil from falling amongst the stones below. It is now ready for the compost. The best compost for the vine is the thin top spit from an old pasture, chopped, and thoroughly mixed with one-fourth rotten horse-dung and one-fourth rotten leaves, or one-third dung when leaves cannot be had. Bones are excellent, broken small, and mixed in the compost; but not indispensable. The border should be two feet deep in a low damp situation, or three feet in a high dry one. To provide for the compost settling below the wall plate, place boards or thin slates against the houses, and keep the border at least six inches above its intended level. This should be done early in autumn, to allow the earth to settle before the planting time. There ought not to be a foot placed on the border; whenever it is needful to walk upon it, boards should be laid on in the places where the person must tread. A border made in this manner will last many years, with the help of a covering of dung every autumn, to be pointed in with a three-pronged fork when the winter is over. The vines intended to plant place in a forcing-house early in spring, in baskets lined with thin turf, and filled up round the balls with leaf-mould. The two top buds only are to be allowed to push. Keep two for fear of accidents, removing one after the vines are planted and quite safe. As soon as the warm weather of May or June sets in is the best time for planting. Holes sufficiently large are to be opened; the vines are brought out one at a time, the baskets sunk, and left to rot, only just covering them; then give a good watering, and secure the vines to the rafters, which finishes the operation of planting. (*Gard. Chron.* 1841, 627.)

Mr. J. Roberts, gardener at Eshton Hall, in Yorkshire, gives the following directions upon the same subject, in his excellent work on "The Vine under Glass."

The width of the borders outside the house ought to be 24 feet, cleared out to the depth of three feet six inches, upon a bottom of retentive clay, well prepared, with one foot of fall from back to front. A main drain ought to run along the extremity of the border, one foot six inches deep, with cross-drains in an oblique direction, leading into it, so as to have perfect command in draining off superfluous water, in order to keep them dry. Place upon the bottom thus formed, broken stones and lime rubbish to the depth of one foot, leaving a depth for compost of two feet six inches. Upon the broken stones, every six or eight feet square, place limestones, of the same nature as the far-famed Skipton rock, which contributes to retain moisture in a dry season, and facilitates the drainage in a wet one. In autumn, when all is ready and the weather favourable, proceed at one end of your border, wheeling in and mixing the materials in proportion as they stand to each other, on no account breaking the materials in mixing, but turn them in as rough as possible, adding one good-sized horse or cow carcase to every ten or twelve square yards; using caution, and not bringing to the surface of the border within one foot, as its assistance is not wanted the first year. (*Roberts's Vine under Glass*, 6.)

As it is natural to have the roots vegetating in a soil of which the heat bears a relative proportion to that in which the foliage is expanding, means should be taken to effect this very essential object. To neglect it is to invite disease and imperfection in the crop; and so convinced of this are the majority of first-rate gardeners, that expensive structures, hot-water pipes, &c. have been proposed for the sole purpose of warming the soil; but we entirely agree with Dr. Lindley, when he observes that there are two reasons why it is not advisable to bury hot-water pipes in a vine border. In the first place, that plant does not require so much bottom heat as the pipes would give; and, secondly, they would dry the earth, and in that way do more harm than they would do service in warming it. If a border is to be heated by hot-water pipes, they must be enclosed in a hollow chamber, so that their drying action may be prevented. It is desirable to guard the roots of vines from frost; but that should be done by a covering to the border which keeps off cold rain and snow, and prevents the escape of heat. (*Gard. Chron.* 1842, 561.)

The best covering for outside vine borders is one of horse-dung and leaves. Of these, Mr. Clarke, gardener at Shirley Park, near Croydon, recommends, in December, eighteen inches in thickness to be laid, and thatched with any material to carry off the water; green broom looks very neat, and will carry off all superfluous water. The covering is to be removed in March, and the border slightly forked up; it is much better to remove it than to allow it to remain one day longer than required as a protection, the sun and air being of the greatest advantage. (*Gard. Journ.* 1845. 219.)

This removal of the fermenting dung in March is not objectionable, but we certainly think that it is much better to continue a covering of dried fern or other similar material until the spring months of cold dry winds are passed. In this our experience coincides with that of Mr. H. Bowers, of Busbridge, who observes that—

The practice of protecting the vine border with straw is particularly beneficial in March, April, and May, when the days are clear and warm, and the nights cold and frosty; the staw is drawn to one side during the hours of strong sunshine, exposing the soil to its genial influence; towards sunset the straw is again spread over the border, and being a good non-conductor it retains in the border much of the solar heat. Always cover after an application of liquid manure, as it in some measure prevents the ammonia from escaping and the heat of the border from being lost; for, with the escape of watery vapour, more or less heat is abstracted from the earth. This should be guarded against where forcing is going forward; for though the fluids may be always in motion, yet the absorbing powers of the plant become less active when the roots are exposed to a low temperature. (*Gard. Chron.* 1845, 52.)

Mr. J. Roberts, gardener at Rabey Castle, is entirely of the same opinion. He says, when the fermenting material is applied a week or two previously to the starting of the vines (which it ought to be, to put the roots in motion), the border is surcharged with moisture, which will be sufficient during the forcing season. When the fruit has changed colour, remove the fermenting material by degrees; but should the season prove dry or hot, leave an inch or two of leaf-mould or rotten dung, to prevent too excessive evaporation. By the heat of July, August, and September, the roots, having been stimulated to give a generous support to the top in time of need, as well as induced to keep near the surface, will, by the powerful influence of the sun and dews during those three months, have become perfectly ripened. (*Ibid.* 1846, 613.)

Mr. G. Fleming, gardener at Trentham Hall, says that when the heat has once reached 80 degs., it continues so without any material deviation, by merely keeping a covering of strawy litter, in which the heat never exceeds 70 or 75 degs. once a fortnight, when it is to be turned and a little fresh litter added, which causes it to heat briskly for a short time. (*Ibid.* 1845, 115.)

If vines are planted outside the house, which we consider a most objectionable practice, their stems ought to be protected during the winter and early spring months; and at the same time, not to give them an unsightly appearance, you may have square wooden boxes, about 6 inches in diameter, with one side wanting, made to fit over each stem, and secured to the front of the house by hooks and staples. The intervening space between the vine and the sides of the box may be filled with hay and dry moss. In summer, these boxes may be removed without injury to the stems of the vine. (*Ibid.* 1843.)

There ought not to be any kind of crop grown upon a vine border: but it should be kept frequently hoed during the summer and autumn. To turf it over is one of the worst possible plans; firstly, because the turf prevents the reflection of heat from the border to the vines; and secondly, because it exhausts the border; and thirdly, because it prevents the free penetration of the air and solar warmth at such times as the border is uncovered.

Planting and Pruning.—No other directions for planting are necessary in addition to those given in a previous section, for the same care is requsite in doing this for those vines which are to be grown out of doors as for those under glass. Yet, as this is by no means an unimportant operation, whether in doors or out, more especially in the latter case, we give a few additional directions. A very fine loose soil should be provided, containing a considerable portion of lively sand, which is well known to facilitate quick rooting. Beneath each vine should be placed a barrowful of chopped turf and of sandy loam, which have been lying together for several months: this being in lumpy masses, not disintegrated, will at once facilitate the escape of moisture and promote a rapid extension of root. To prevent sudden droughts owing to extreme porosity, the looser compost may be strewn through and over the fibres. The best time to plant is when the plants are about emerging from their torpidity, whether naturally or induced. The ball of earth should be carefully separated, and the roots trained as carefully out as an exhibition flower on a trellis. When merely covered with a fine compost, a layer of the same turfy matter may be placed over it, and over that a mulching of such fermented droppings and litter as gardeners prefer for making a mushroom bed. If in doors, they require skilful applications of water for the first four months: after which they may have it more frequently in the heat of summer, especially if they have made much progress. Those planted outside are liable to suffer in the first four months through drenching rains. If such occur, it is a good practice to place old hotbed lights over them: if such are not to spare, oil-cloth, tarpaulin, &c. will readily suggest themselves. If, however, the summer is hot and dry, frequent sprinkling will be necessary: let little and often be the maxim.

With respect to summer pruning, we say let the young vines ramble freely, training the wood so as to expose every available surface of leaf to the light. The complete elaboration of a few select buds is as nothing compared with the ultimate advantage arising from a border well filled with roots. For, rest assured, the volume of roots will be in direct proportion to that of the top, although unseen.

The system adopted by Mr. Mearns is as follows: The vines are planted inside the house at two feet and a half apart, nearly close to the front wall, and are headed down to within a foot of the soil. One shoot only is allowed to proceed from each plant, which at the end of the first season is cut down to the second or third eye. Next year two leading shoots are encouraged, the strongest of which is stopped when it has grown three or four joints beyond the middle of the roof, and the weaker, after having grown three or four feet, for the purpose of strengthening the eyes. At the fall of the leaf the leading shoots are reduced, the main one to the length of the middle of the roof, and the lower one to the third eye. In the third season, one leading shoot is trained in from each shoot, and from the leading shoot fruit-bearing side shoots are produced. One bunch is left on each, and the shoot stopped at one or two joints above it. No sides shoots are allowed to proceed from the spur, the leading shoot from which is to become the bearing wood for the next year. Thus, in the autumn of the third season the lower part of the house is furnished with a crop of grapes from shoots proceeding from wood of the preceding year, and parallel to this bearing shoot on each vine is the young shoot for the next year's crop.

In winter, the shoot from the extremity of the bearing branch is cut off at the top of the roof, or within twelve or fifteen inches of it, and the shoot from the spur is cut down to the middle of the roof, and all the spurs which had borne the grapes are now cut out. Each vine is now furnished with two shoots of bearing wood, a part of old barren wood, and a spur for producing a young shoot the following year. In the fourth summer a full crop is produced, both in the upper and lower half of the house. The longer shoots bearing on the upper half of its length, and the shorter on its whole length; a leading shoot is produced from the short shoot, and another from the spur. In the pruning season of the fourth year, the centre shoot is entirely removed, and replaced by the side shoot, now the whole length of the roof, and this side shoot is in its turn supplanted by the shoot from the spur, while a spur is prepared to succeed it.

It is sometimes necessary, observes Mr. Main, to lay in shoots of great length, as is the general practice in pine stoves, or to fill the trellis in common vineries. In such cases much care is required that a regular and sufficient number of the fruit buds should break from top to bottom, and prevent the lower part of such shoots from being quite naked and barren. To avoid this let the pruner, after cutting the shoot to the required length, and finding, from the firm texture of the wood, that it is sufficiently ripened, proceed to thin the buds as follows: viz. leave the uppermost bud, which may be called 1, cut out 2 and 3, leave 4, and cut out 5 and 6, leaving 7, and displacing 8 and 9, and so on to the bottom of the shoot. This thinning of the eyes will cause all those which are left to break regularly, and so alternating with each other, that the disposition, whether for the sake of superior fruit or facilitating the future management of the tree, will be found exactly what the manager would wish; he taking care to stop all the young shoots in their progress, immediately beyond the fruit, except the lowest, which must be trained to its full length for similar management the following year. (*Gard. Mag.* ii. 413.)

Summer Pruning consists in rubbing off ill-placed and superfluous shoots as soon as they appear, and in shortening or stopping those destined for bearing.

Stopping, it has been well observed, has its limits, the passing of which will lead to weakness in the constitution of the vine. Two reasons seem to exist in favour of the process; the one, concentration of the powers of the vine for a period in the immediate neighbourhood of the fruit, thereby increasing its size; and the other, the prevention of the secondary shoots of the vine from overlapping and smothering the principal leaves. After these points are duly accomplished, vines, especially young ones, may be allowed to ramble freely, more especially in the period between the first and last swelling, or during what is termed the stoning process. It is by no means uncommon to see young vines nearly destroyed by overbearing, especially the Muscats. These "show" in an extraordinary way, on strong young canes in newly-made borders; but if the fruit be allowed to remain, and close stopping resorted to, the constitution of the Muscat will be completely broken up. Let such make as much wood as they please. (*Gard. Chron.* 1846, 359.)

We prefer stopping at one joint beyond the fruit, as is the general practice, but some stop close to the bunch. In either case the leaf accompanying the bunch must be carefully preserved, otherwise the fruit will not attain perfection. In case of accident to this leaf, it is better to have one at the joint beyond the fruit, to elaborate, as is absolutely necessary, the sap. Mr. Mearns, however, is of a contrary opinion, and says, "Stop the bearing branches at the bunch instead of the next joint above it, which is the usual practice; for the fruit does equally well, and it allows a much larger portion of light to come into the house, together with a more free circulation of air among the fruit and young wood. Blind all the eyes on each fruit spur as soon as they push above a joint or two, before pinching them back, always cautiously retaining one eye; and be particularly cautious that nothing should happen to injure the leaf that accompanies the bunch, for, if that is lost, the fruit comes to nothing." (*Hort. Soc. Trans.*)

When vines will not break at the lower buds, depress the shoots and shade the upper extremity until the lower buds have started. If the bend is at the place where the buds are dormant, the operation expedites their appearance. (*Gard. Chron.* 1841, 169.) Another good suggestion made by Mr. Power, of Raynham, is that, in forcing vines pruned on the spur system, besides the one eye left upon each spur, a number of eyes will be formed about and between the spurs and the main stem. In looking over these, after they have made their appearance, care should be taken to rub off all, with the exception of one or two to a spur, and those should be left in the most favourable situation, on the upper side, or front of the spur.

Mr. T. Appleby, gardener at the Fence, Macclesfield, also considers the best mode of pruning the vine to produce certain crops of fine well flavoured fruit, is undoubtedly the "spur system," but as he offers some fresh hints, we give the detail of his practice. The first season after planting, he says, train one shoot to each rafter, stopping at the first joint all the laterals, and nipping off every tendril. When the shoot has reached three-fourths of the length of the rafter, cut off the bottom laterals, and continue from time to time to remove them all the way up as the wood hardens. This season do not stop the shoot at all, but continue to tie it in across the top of the house, to obtain as long and strong a shoot as possible. The second season prune down to three eyes from the bottom of each rafter, and allow one bunch of fruit to each vine, to prove the kind. Train the uppermost shoot to the rafter, managing in the same way as the first season, excepting stop it by pinching off the end near the top of the rafter, to strengthen the lower buds. The two bottom shoots stop at the third or fourth joint to make spurs. If the vines are strong, they will push again, when stop them at the first joint, repeating this as often as they shoot again. Tie them in at nearly right angles, to give the leading shoot all the benefit of the sun and air. In the third season the vines should be very strong, with short joints and plump buds. If the wood is sound, firm, and of a good brown colour, cut out one third the length of the rafter, which will mostly be six or seven feet. Train the top shoot up the rafter again, repeating the same operations of removing tendrils, stopping laterals, &c., stopping it at the top. The side shoot or spurs stop at the joint which shows fruit, and only leave one bunch on each spur. This is a general rule for every year afterwards. Tie each spur at right angles from the centre, so that there are two rows of bunches, one on each side of the rafter. The fourth season bring up the spurs to two-thirds of the intended length of the vine, following the system as during the third season, with this difference, that if any of the spurs are weak and show poor bunches of fruit, nip off the bunch to strengthen the spur. The fifth season the shoot extends the length of the rafter, so that in four years you have all the rafter clothed with fruit-bearing spurs; after which all they require is to cut through the second bud every pruning season. Only leave one bud to each spur, though some cultivators leave two; but in that case the spurs will too soon become long and unsightly; and the farther the bud is from the main stem, the weaker it will be. Even with one bud each year the spur will in time require renewal. To effect this, train up a young shoot from the bottom, and the year after cut off the old shoot with all its spurs, and manage the young one exactly in the same way as a young vine. Do this to every other vine, as the house would be without fruit one or two years were they all cut down at once. Suffer those that are cut down to get into a bearing state again, and then cut down the remainder.

The question may be asked, when is the proper time to prune the vine? This entirely depends upon circumstances. If they are to be forced early, they must be pruned early. It may serve as a general rule, to prune at least six weeks before it is intended to begin to force: if it can be done two months previously it will be better; the pores of the wood, when it is cut, will then be stopped so as not to bleed when brought into a higher temperature. (*Gard. Chron.* 1841, 659.)

As a general rule, spurred vines confined to the rafter, and established on the principle of border-making before detailed, will, under good management, produce from fifteen to twenty pounds weight each, every year, for many years. Vines spread over the whole house will yield a third more. It is, however, a better plan, where very superior fruit is the object, to keep below this mark. The leading shoot, if there be one, is a pretty good criterion of the energies of the vine; this, if it is honestly cropped, should always be disposed, and also allowed, if possible, to ramble freely. (*Hort. Soc. Journ.* 51.)

Training. The simplest mode of providing for the training of a vine up the rafters of a house, is to drive long shanked nails with eyes at the head every two or three feet, so that a wire can be strained through these eyes the whole length of the rafter; and if other plants are to be grown in the house, one branch along each rafter to bear fruit, and one growing for the following year's bearing, are all that need or should be grown; indeed at the ordinary distance of rafters, it is advanced to the contrary, the extent of, and the injury sustained from these is innumerable, as much work as a vine ought to do for many years. Any other fastening injures the rafter itself, whereas the wire being a fixture, the vine branch needs only to be tied to the wire with good twisted bass matting, which will last the season; at the end of which the old branch is cut away, and the new one may be fastened in its place. (*Gard. and Florist.* iii. 431.)

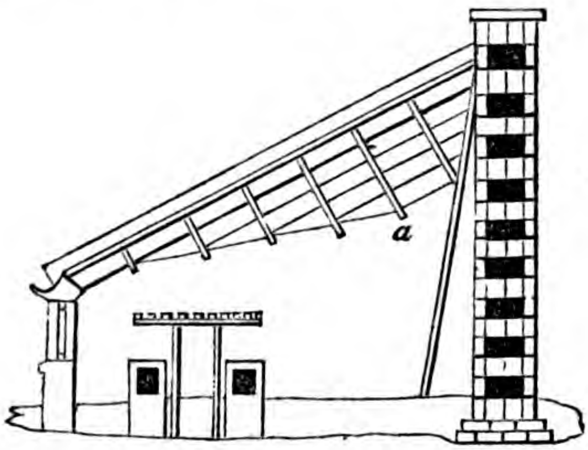
Another mode is by having wires extending longitudinally the whole length of the house, through eyes fastened about twelve inches apart into the rafters.

A third plan, is to have the vines planted in a border at the back of the house inside, and to train them *down* the rafters. This plan was suggested by Mr. W. Smith, of the Chiswick Gardens, and is thus recommended by him.

The common practice in vineries, he observes, of training the trees from the front to the back, upon laths or wires fixed to the rafters under the whole of the glass roof, forms so impervious a shade to the floor and back wall of the house, as to render both these places almost useless for any other purpose.

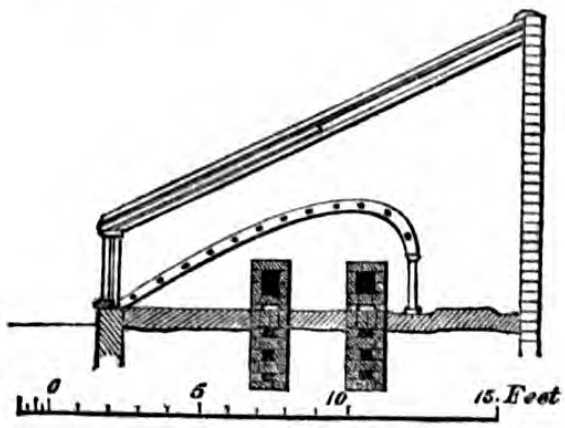
To get rid of this inconvenience, it occurred to Mr. Archibald Read, gardener at Balcarras, to confine the vines to the space immediately beneath each rafter; and in order to retain the same or any additional number of fruit-bearing shoots, he formed a kind of drop, or hanging trellis, by wires fixed to each side of the rafter, descending vertically, and attached to a slight wooden frame of the same width as the rafter, fixed from the front to the back wall, and depending from two feet at the front of the house, to five feet at the back part. Each rafter having such a frame, the vines are trained on each side of them, by which contrivance a greater surface of fruitful vines is obtained, and also a far greater share of light.

Different modifications of this plan have been adopted; one of the simplest is, a single surface of wires suspended by iron rods (*a*) The judicious gar-



dener will adopt wires or wood, a double or single trellis, and greater or less depth, as may best suit the particular circumstances of his case; he will not forget to allow himself head-room over the path, and that it can never be desirable to have such trellises very deep, on account of the distance to which the lower part of the foliage would be removed from the glass. These circumstances taken into consideration and acted on, hanging trellises may be an improvement in the construction of the vinery, and applicable also to the peachhouse, but we consider it very doubtful. (*Hort. Soc. Trans.* vi.)

Mr. J. Acon, gardener to the Earl of Surrey, at Worksop Manor, has suggested another mode of trellis training, which is superior to the usual mode by not rendering the house dark, by preserving the grapes from the consequences of sudden violent depressions of temperature, and by enabling other trees to be cultivated against the back wall. Mr. Acon adopts a wide flat-roofed house, plants the vines within the house at



the back and front, trains them on an arched trellis with horizontal wires one foot apart (see above plan), and on the back wall. He commences forcing on the 1st of September; and the fruit begins to be ripened about the first week in March, and continues to be gathered till the middle of May. About six weeks after the forcing has commenced, vines are introduced from the front, and trained under the rafters, which yield a succession crop, from the early part of May till late in June, when the vines in the pine-stoves produce their crops. By the form of the trellis, which admits of the use of the whole of the back wall, and of at least one shoot on each rafter, this house presents the greatest possible surface for the growth of the vines, consistent with sufficient light. Mr. Acon has proved by experiment that vines will ripen their fruit a fortnight sooner on the trellis than on the rafters. (*Hort. Soc. Trans.* vii.)

The late vinery under Mr. Acon's care is narrower and has a steeper roof, like that of Mr. Saul's, delineated in a previous page. Its flues are on arches, as in the preceding, and the vines are planted within the house; and trained on a trellis near the glass. The house is shut up about the middle or end of May, as soon as the bunches make their appearance; and till they are out of blossom the air is kept very warm. This is of more importance than is generally imagined; the wood which has to bring the future crop will be all made during this period. In a good heat it will be found to grow more compact, and to receive a form better calculated to produce and ripen fruit under the cold atmosphere to which it is afterwards exposed. If the house be kept too cool at the beginning, the wood will be soft and long jointed, and therefore subsequently barren. Those who attempt to grow late grapes must pay serious attention to this circumstance: the failures of many may be attributed to the neglect of it. (*Trans. Hort. Soc.* vii.)

Forcing.—Mr. Beaton, gardener to Sir W. Middleton, at Shrubland Park, near Ipswich; Mr. G. Fleming, gardener at Trentham Hall, and some other first authorities in horticulture, are of opinion that September is a better time to begin to force vines than any time between that and the middle of December, as the fruit is set before the middle of November, and has more assistance from the sun than it would have in January, at which time it would be setting if started in November, the usual time for beginning to force for an early crop of grapes. (*Gard. Chron.* 1845, 115.) Notwithstanding these reasons and authorities, the majority of gardeners do not begin forcing until the end of October, or early in November, considering that to begin earlier does not allow the vines a sufficient period of rest.

Mr. Appleby, already quoted, says that in places where there are a number of houses devoted to the vine, it is possible to have ripe grapes all the year round. To accomplish this completely, six houses are necessary, though it may in some degree be done with three. In the former case, the first house ought to be started at the end of October, the second on the first of December, and so on, the first day of every month till April. Where there are but three houses, it will be early enough to commence the first house in November, the second in February, and the third in April. To cause the vines to break equally all the length of the shoots, tie them down to the front windows, until the buds are all expanded, that one part may not be more excited than another. When every bud has pushed, carefully separate the vines one by one; regulate the shoots, stop them, and thin the number of branches, and do all that is required. Then tie them up loosely to the rafter; and should they hang down a foot from the glass, it is an advantage, especially during the early part of the season. (*Gard. Chron.*)

Temperature.—We quite agree with Dr. Lindley in thinking that there can be no doubt that 48 degs. is quite high enough at night for grapes in the first month of their growth, and 54 degs. in the second. The reason why a low temperature at night is desirable, seems to be that if much heat and moisture are applied to a plant in vegetation, it must grow in proportion to the amount of those agents. Now, it is in daylight only that plants can digest their food and harden their texture; and the amount of digestion, and consequent hardening, will be in proportion to the intensity of the light they receive. If, then, they are compelled to grow in the dark, they are filled with undigested sap, and their wood becomes watery and soft. Even where they can be excited each day by very powerful light, it would seem that nature exposes them to no such risks, although one might suppose that beneath a southern sun the mischief caused at night might be repaired during the day. How much more, then, in these dull, northern regions, where we never behold the sun in all his brightness, and for weeks together in the spring, only as he struggles through clouds, how much more ought we to avoid that nightly growth for which our daylight can bring no help! (*Gard. Chron.* 1844. 35)

Quite coincident with this reasoning is the confirmed practice of our best vine forcers, as is thus detailed by Mr J. Roberts, gardener at Eshton Hall, in Yorkshire. He says the temperature must not exceed 55 by day, and may be allowed to fall to 45 in the night, until the buds are in motion. They will then require a little more heat, raising the temperature gradually until it attains 53 by night by the time the first leaves are fully expanded; always allowing them 10 or 15 degs. more by day, or sun heat, keeping a moist temperature, syringing and shutting up early in the afternoon. As they advance raise the temperature by day to 80, 85, or 90 degs. by sun heat; if by fire, 72 or 75 degs., syringing and shutting close up, early in the afternoon, allowing the temperature in the night to fall back to 58 or 60 degs. (*Roberts's Cult. of the Vine*, 22.)

Mr. G. Fulton, gardener to Lord Northwick, also concurs in the importance of a low night temperature, though, like the late Mr. Knight, he finds that in lighter days the vine will bear a very high temperature, occasionally, with advantage.

He says, to have an attentive eye to the young shoots at an early period of their growth is of great importance; and, to procure round short-jointed wood, his practice is to keep a low temperature in the night, and a very high one in the day. Vines by such a mode of treatment are not excited in an unnatural degree, and nature is more imitated than exactly followed, which may be said to be the main principle in the art of forcing. He has frequently, in the spring months, had the mercury in the thermometer stand at 110 degs. in a pinery early in a day, when, with abundance of moisture, vines have grown very rapidly with round short-jointed, instead of flat long-jointed shoots, caused by an extreme of fire heat in the night. The observations already made he wished to be understood as applicable to pines as well as vines, where they are necessarily grown together. (*Gard. Mag.* vi. 707.)

Mr. Appleby agrees in the propriety of commencing forcing at a low temperature, adding—The first week keep up the heat to 50 degs., the second to 60, the third to 65, and the fourth to 70 degs. Night temperature about 10 degs. lower. A good rule is 60 degs. for vines in leaf, and 70 when blooming and ripening fruit; the night temperature may then be 20 degs. lower.

Syringing.—Some excellent gardeners practice this less or more through most of the forcing period: some equally good gardeners entirely dispense with it. If sufficient atmospheric moisture is provided by means of a permanent character, little syringing will be needed. It may be practised with benefit during the time the buds are swelling, two or three times a day. When blossoming commences it must be altogether omitted. It may be resumed again until the berries are as large as peas, when it will be better, in our opinion, entirely dispensed with; taking care to provide plenty of atmospheric moisture in lieu of it.

The desirable amount of moisture in the air of the vinery is by no means arbitrary, but ought to be regulated according to the rule pointed out by nature. Her law is that the moisture of atmospheric air, unaffected by accidental causes, is proportional to its temperature, the moisture increasing with the heat. The exceptions offered by the sirocco and other hot dry winds, have their accidental origin from passing over arid torrid plains incapable of affording moisture to the passing air. The consequences such winds bring upon vegetation is well known to be destruction of its foliage, and, in many instances, death. Air at rest, as in a hothouse, does not absorb moisture so rapidly as air in motion; therefore if the whole area of its floor was a tank of water, the air confined within the house would never be so saturated with moisture as air at the same temperature passing over water, moist earth, and vegetation, as in the ordinary course of nature. To obviate this, gardeners promote the diffusion of watery vapour through the air of their hothouses, by placing pans of water upon the flues, by having open gutters of hot water within them, and by even admitting jets of steam. The difficulty attending all these processes is to have the amount of vapour in a natural proportion to the temperature of the house. A little inequality is not of much consequence, but, other treatment being correct, the nearer to the dictate of nature, so much nearer will the plants be to a state of best vigour.

A consequence of air being duly impregnated with moisture is, that evaporation of water from a given surface exposed to that air proceeds slowly, shown by its causing but little cold. This is demonstrated by the following registries of thermometers, kept at Calcutta, during some of the months of 1841 and 1842. In June, August, and September, the air there is saturated with moisture. In December, January, and February, it is driest.

		Average Temp. of Air. at Noon.	Average Temp. of Evaporating Surface at Noon.
1841.	June	91.6 deg.	85.4 deg.
	Aug.	86.8	83.0
	Sept.	90.2	84.3
	Dec.	81.6	72.5
1842.	Jan.	84.5	73.8
	Feb.	90.4	77.4

The easiest mode of ascertaining the difference between the temperature of the air and an evaporating surface is by having two equally graduated thermometers hanging in the hothouse, with the bulb of one inclosed in a piece of thin muslin. Upon moistening this with water of the house's temperature—made so by keeping it in the house—the number of degrees this causes the mercury to sink will be the difference between the air's temperature and that of an evaporating surface. In the winter months the gardener may be satisfied that the air has the desirable moistness if that difference be not more than 6 degs. and during the summer months 3 degs. This is much less than the difference found by observation in a tropical climate, but there the evaporation was promoted by exposure to a free circulation of the air.

Connected with this important portion of the practice of forcing is the following table, shewing the number of grains of water at the temperatures named, contained by a cubic foot of air saturated with moisture.

Temp. of air.	Grains of Water.	Temp. of Air.	Grains of Water.
20 deg.	1.52	62 deg.	6.21
22	1.64	64	6,60
24	1.76	66	7.0
26	1.90	68	7.43
28	2.03	70	7.90
30	2.25	72	8.40
32	2.32	74	8.95
34	2,48	76	9.53
36	2.64	78	10.16
38	2.82	80	10.78
40	3.02	82	11.49
42	3.24	84	12.20
44	3.48	86	12.91
46	3.73	88	13.61
48	3.98	90	14.42
50	4.24	92	15.22
52	4.52	94	16.11
54	4.82	96	17.11
56	5.13	98	18.20
58	5.51	100	19.39
60	5.83		

Although syringing and steaming, duly regulated, are unexceptionable practices occasionally; yet, as before observed, they are not to be depended upon solely as the means of keeping the air of the hothouse in a proper state of moisture, in conformity with the natural laws already pointed out. Gardeners know this from their experience, and have adopted, consequently, several modes of keeping the moisture of the air always accordant with its temperature. The most efficient plan we have previously described, but another is as follows:

Mr. Milne supplies a compound vapour to his vines by sprinkling his vinery every afternoon, when first shut up, with water, and then throwing down about a quart of gas ammoniacal liquor on the front pathway. When thrown on the soil, he has found that the liquor did not smell so much as when sprinkled on the stones or hard-burnt bricks. He has no doubt but this method would be sufficient without placing it in cans, if it could be applied in the morning without offence to the family. It has a bad appearance on the pathway, and no lady or gentleman would like to walk over it; its smell being bad enough, without the sight of it. He had three tin cans, holding about a quart each, in a house 42 feet long; and he found that in two days the liquor wasted to one-third of its usual bulk, and changed from a clear small-beer colour to a thick substance like coal-tar. It was never applied to the roots of the vines. (*Gard. Chron.* 1842, 761.)

Closely connected with the regulation of the vinery's atmospheric moisture, is the due admission of air, (see *Ventilation*); indeed, it will be found that every writer has found himself more or less obliged to amalgamate the two when considering ventilation, as in the following comprehensive and sound remarks of "A Practical Observer." He says—

A hygrometer is just as necessary in a vinery as a thermometer, and probably the time will soon come when we shall as seldom see a house without the one as the other; and wherever one is used, it will be found that it is not a sprinkling of water on the flues or pipes, once or twice a day, that will keep a sufficiency of moisture in the air, but that water should be almost constantly on the pipes; and that the borders, footpaths, &c. should be sprinkled frequently besides. But, as much judgment is required in managing this, let the hygrometer be your guide. The admission of fresh air is intimately connected with the preceding; yet almost invariably do we see air admitted without the slightest regard to its effects on the internal atmosphere, further than keeping down the heat. In long-continued dull, cold weather, the houses are usually kept nearly closed; consequently more moisture is retained than usual, and the shoots and leaves are tender, and very susceptible of injury from sudden change; but as soon as a strong, clear sunshine occurs, the houses are opened, and air let in unsparingly to keep down the heat. The vines are thus checked; and if this happen just when the grapes are colouring, they do no more good, but assume a dull brown colour, viz., the dingy hue so well known and so much dreaded by gardeners; and when this happens, nothing will recover them. The too frequent practice of keeping on strong fires, with the view of remedying the evil, only aggravates it. From the time the vines are started, the strictest attention ought to be paid to admitting air, and to its effects on the hygrometer. In cloudy, wet weather, short fires are to be put on in the morning, so as to raise the heat nearly 10 degs. above the night temperature, and a little air admitted both at front and back of the house, taking care to keep plenty of water on the pipes; for a strong fire-heat, accompanied by a brisk circulation, will be found very injurious, if not counteracted by moisture. In bright weather, equal attention is necessary; for, if a great deal of air is admitted to keep down the heat, it is impossible to keep the atmosphere sufficiently moist, consequently the vines suffer. Air ought to be admitted not so much to keep down the heat as to keep a current of fresh air in the houses; and small openings at front and back are quite sufficient for that purpose. Vines will seldom be hurt by sun-heat, if surrounded by a properly moistened atmosphere; but to retain this in dry, hot weather, the utmost vigilance is necessary. As, then, there is but little heat in the pipes, they ought to be kept deluged with water; indeed, the return-pipes should always be laid in gutters, so that they can be kept covered with water when required. Now, although strict attention must be paid to the admission of air, it is not intended that the ventilators are to be opened and shut always as a cloud passes over the sun; for, although the thermometer may be kept pretty steady, it is impossible to keep the hygrometer so too. A little air ought to be admitted as soon as the sun raises the heat a few degrees; and in an hour or two a little more, or as much as you think will cause a sufficient circulation, without putting it out of your power to keep up a sufficiency of moisture. If there is absence of sunlight at the time of colouring, fires ought to be applied to the house, raising the temperature to 72 degs. at night, and maintaining a dry atmosphere. If you have flowers in the vinery, take them out. Should your grapes begin to colour in March or April—the most precarious months in the year—when the sun begins to shine, and there is every prospect of a fine day, put out the fire immediately; and as the sun raises the temperature in the house to 76 degs., give about half an inch of air to every sash at top, but none in front upon any account; and when the heat rises to 78 degs. give as much air again, and so on until the thermometer stands at 85 degs. Be sure not to allow the heat to decline without taking the air away by degrees, as it was given; ultimately, when closing the sashes, the house is at 76 degs. At the last movement of the sashes, half an inch of air only should be shut off; for, if you have a foot or six inches of air on each light when the heat is at 85 degs., and you suffer the temperature to become colder without reducing the air a little, then the berry shanks. In March and April, a day's sunshine is very acceptable, and the gardeners throw open their houses, and allow them to be open until the heat is only 70 or 76 degrees; they then close the house, and the heat rises again, and does more harm than the sun has done good. (*Ibid.* 1845, 722.)

Setting the Grape, says Dr. Lindley, like that of all other plants, is accomplished by bringing the pollen in contact with the stigma. The stigma is a viscid space, often extremely small, upon the upper end of the young fruit; the pollen is a fine powder, contained in the anther, which is a bag that must be split open in order to permit the pollen to escape. To insure the setting of a fruit, it is, therefore, indispensable that the anther should be placed in a situation favourable to its opening. Nature rarely provides mechanical means for effecting this important operation, but, by a simple and beautiful contrivance, insures its taking place spontaneously. The anther is formed of a membrane whose lining consists of an infinite multitude of delicate springs, so arranged, that by their contraction in opposite directions they pull open the sides of the anther along a line which is thinner than any other part. In wet weather, or in a green state of the anther, these springs are relaxed, and are incapable of action; but when the anther ripens, and the air is dry, they contract, and pulling against each other, their combined action is sufficient to rend asunder the sides of the anther and to permit the pollen to escape. If any one wishes to behold—not the phenomenon itself, for that is microscopic, but its effect—let him station himself near a Red Cedar, or a Chinese Juniper tree, in a warm, dry, spring morning, and he will see the air filled with myriads of little glittering particles; these are the grains of pollen discharged into the air by the natural elasticity of the anther-springs: let him observe the same tree in a wet morning, as windy as he pleases, or with the rain pattering upon the flowers, and he will not find a symptom of the dispersion of pollen. And why is this? Nature never chooses her seasons of action in vain. It is because the natural glue upon the stigma enables the pollen to adhere, and it is necessary that the adhesion should be complete if setting is to take place; but an atmosphere charged with moisture dilutes the natural glue, and renders the attachment of the pollen to the stigma precarious. Moreover, if the anther could open in wet weather, the pollen would not quit it; for although the latter is often dispersed by its own buoyancy, yet if the particles hold together in masses, as happens when damp, they are then incapable of floating. (*Ibid.* 1841, 259.)

These facts demonstrate why the gardener finds it necessary to have the air of his hothouse drier during the blooming time than at any other. Yet, with all his care and science-directed art, impregnation of the grape in a vinery very often fails. The Tokay is one that sets with difficulty, but Mr. D. Wright of Greenland, near Paisley, says the difficulty is overcome if, before the vines come into flower, they are kept in a temperature of from 70 to 75 degrees; and on the first opening of the flower, gradually lowering the temperature to 60 or 65 degrees, the air is then less moist, and they set freely, and as well as the Hamburgh and other free-setting kinds. (*Gard. Mag*. vi. 602.)

A more mechanical mode of effecting the impregnation, however, is often necessary; for, to quote the words of Mr. J. Craig, gardener at Howsham, near York—

On close inspection, when the blossoms are fully expanded, it will be obvious to every observer who is acquainted with the parts of fructification, that the main cause of their abortiveness is a defect in the filament and not in the anther, as supposed by many. It will be found that the filaments are very small and recurved, so as to render it almost impossible for the anthers to come into contact with the stigma of the same blossom. There is a sufficient quantity of pollen on the anther for the fecundation of the stigma; but so awkwardly is the anther situated, that in very few instances can the pollen perform its function on the stigma without the assistance of art.

Hold a sheet of white paper under the bunches from which it is intended to gather the pollen (selecting those which are fullest in flower), and then apply the pencil gently to various parts of them; and when the pencil is charged with yellow powder, apply it to the bunches to be fecundated, and touch lightly with the pencil the female parts of the flowers, holding the paper as when gathering the pollen. The pollen may be obtained from the same vine, or any other in blossom at the time. (*Ibid.* vi. 688.)

Thinning the Berries.—As soon as the berries are set, and swollen to the size of a small pea, it is time to thin them. For this operation there are proper scissars, with long handles and short blades. Provided with these, some good soft matting, and with something to catch the berries in (which make excellent vinegar, or tarts, &c.), commence the operation by tying up the shoulders of such bunches as require it, to the wires on each side of the rafter; or, if the bunches are very large, fasten some thin narrow lath to the rafter, to tie the shoulders to.

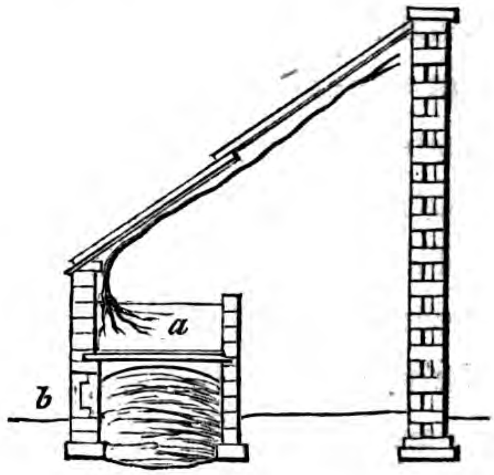
Some persons use a thin piece of lath notched at each end, to prop the shoulders off from the main body of the bunch; but we do not like this plan so well as the matting, the props being apt to drop out.

In order to have large berries, thin very freely; so much so, that the bunches look like skeletons. Of course thin according to the kind. Some sorts, under the best management, do not swell to such a size as others; hence it is necessary to know the medium size to which every variety will swell, and thin accordingly.

Vines in Frames.—The following system of growing the vine in frames, which is well adapted for gardens where the quantity of glass is limited, is practised by Mr. Dawson, gardener to Lord Ducie, at the Hoo, Hertfordshire. About the first week in April, a bed of partly-decayed dung, to which a small quantity of raw material is added, so as to produce a slight heat, is made at about 18 inches from the wall in front of the selected vines. This bed is built sufficiently deep to admit of its being about 3 feet high after settling. The frame used by Mr. Dawson separates into two portions, so that the lower part can be first placed upon the bed. It contains a trellis upon which the vines are trained, fixed about a foot above the surface of the dung. The upper portion of the frame can be afterwards put on, and secured to the lower by small brackets. The advantage of having the frames constructed in this way, is the ease and safety with which the vine can be taken in; since, in introducing the shoots of a vine through a hole cut in the back of a frame of ordinary construction, the buds would be liable to be rubbed off. No more care is required, except in stopping, thinning, &c. Air is given freely, but no linings to the bed are required.

In severe weather a covering is put on, but this is not generally resorted to. By pursuing the above method, fruit of good quality has been cut by the latter end of August; for which, Mr. Dawson has obtained several prizes at local horticultural exhibitions. (*Gard. Chron.* 1843, 54.)

The Rev. B. Cooper, for many years, forced vines trained under glass cases, resembling melon frames, with the aid of stable dung only. The border



on which the vines were planted (*a*) was within the frame, and raised by means of cast-iron joists, and Welsh states, over a cavity which, from time to time, was filled with hot dung, through openings in front (*b*). By these simple means he raised abundant and early crops. (*Trans. Hort. Soc.* vi.)

Ripening Process.—A dry atmosphere and a most free ventilation are the requisites, in order to obtain high flavour with perfect berries. Too much air can scarcely be indulged in, providing the thermometer can be kept from descending below 60 degrees.

Slow ripening, if not carried too far, conduces to high flavour, and with vines inclined to shrivel or shank, slow ripening will be found the safest plan. This seems to point to defective elaboration, and that the tree, or rather the leaves, cannot provide matter sufficiently quick to feed the produce, much less to return a surplus to the root to meet the exigencies of the coming year.

Rest.—There is no real necessity for turning vines out during the resting season, providing they are kept in a somewhat low temperature in doors, and where they will be occasionally moistened in the bark and receive a little air. The thermometer, during this period, need not be much above 32 degrees, and should not be allowed to range above 55 degrees.

If they are turned out, let them, by all means, receive protection from frost. They will bear a moderate amount, but will be found much better laid flat on the ground and covered with ordinary litter.

CALENDAR.

The following succinct calendar of in-door vine-culture combines the chief principles of cultivation, applicable conjointly to stove forcing and ordinary greenhouse culture. Instead of arranging the subject in monthly divisions, it has been deemed expedient to divide it into the following heads, founded on the habits of the vine :—

1. Preparatory steps to the commencement of forcing.
2. "Breaking" or budding period.
3. Blossoming period.
4. Thinning the berry.
5. First swelling of ditto.
6. Stoning period.
7. Second swelling.
8. Ripening period.
9. Preservation of fruit on the tree.
10. Ripening the wood.
11. Rest period.
12. Border management, including renovation of bad borders, &c.

Before proceeding with the discussion of these heads in the order in which they stand, it is necessary to remark, that the period selected for the commencement of forcing is the first week of February.

By assuming this period, the principle of both vine forcing, in the ordinary acceptation of the term, and greenhouse culture may be combined. The great and general utility of such a calendar will, we think, be obvious.

1. Preparatory Steps.—In the first place, the flues (if any) should be thoroughly cleaned, and the house painted within, if requisite. At all events

it is a most prudent step, and by no means expensive, to apply a wash to the walls. Ordinary lime or whitewash is generally used; this, however, may be coloured to any desirable tint. The most important point is, to take care that abundance of sulphur is mixed with the wash: it is scarcely possible to add too much, remembering that a profusion of sulphur gives a very yellow tint to the wash, which may readily be subdued by a mixture of umber or tan water, made by straining a limited quantity of water through a good deal of tan. A wash of this kind will destroy the eggs of numberless insects, and is one of the best safeguards against the depredations of the red spider, the great enemy to successful grape culture. These things being accomplished, and the heating apparatus in order, the vine stems should receive a wash. Work some clay in warm water to a thin paint; add to a gallon of this, a pound of sulphur, half-a-gallon of strong tobacco water, half-a-gallon of fresh slaked lime, and beat up a lump of soft soap, as large as a walnut. This will be found a destroyer of any eggs which may lurk in the old bark of the vine, and a valuable assistance in preventing the ravages of the red spider. When the old bark has become loose and rough, it should be stripped off previous to the operation. As vines of luxuriant growth are liable to bleed under the application of artificial heat, it is our practice to daub a patch of white lead or thick paint on every wound of the knife; this, however, should be applied the moment the vines are pruned in the end of autumn.

2. Breaking Period.—The house being now closed, some little advance in temperature will, of course, take place, independent of fires. We may as well state, however, at the commencement of this division of the subject, that slow "breaking" tends to equalize the sap, or in other words, the aggregate strength of the vine; whilst hurried "breaking" tends to give an undue preponderance to the upper parts already gorged, it may be, at the expense of the inferior or weaker parts. The chief point, in addition, is to secure plenty of atmospheric moisture: in fact, the stems, from the commencement of forcing until the leaf begins to expand, should be seldom quite dry. The old plan of introducing fermenting matter in some parts of the house, during this period of breaking, has ever been found an excellent practice. However, in the modern and improved mode of producing atmospheric moisture, such may be in the main dispensed with. Until the buds are actually developing, little alteration of either heat or cold, moisture or dryness, is necessary: a temperature, ranging from 45 to 55 degs. will be found sufficient until the buds begin to unfold. When such takes place, a gradual rise must commence in the thermometer, of a steadily progressive character: such

advance, for the most part, taking place in the day, more especially in the afternoons of those bright and sunny. By the time the blossom is fairly developed, a day temperature of 70 degs. ought to be insured, if possible, sinking at night to 60 degrees. On sunny days the thermometer may be allowed to rise to 85 degs., from two o'clock until four, provided a slight circulation or motion in the air be provided: this latter is of much importance under high temperatures, for it will prevent scorching, which sometimes takes place if much atmospheric moisture is present under a high temperature without motion. As the leaf is being developed, some alternations of moisture and comparative dryness must be allowed to take place. As a general maxim, we would say, ventilate rather freely, and allow the atmospheric moisture to be dispersed, from nine o'clock A.M. until two o'clock P.M., after which, close and encourage atmospheric humidity—not, however, all at once, if sunny—reduce the air in part at two o'clock, and close for the evening at three. During the "breaking period" the syringe may be freely applied whenever necessary, in order to keep the wood in a somewhat moist state; for ordinary purposes, twice a-day will suffice: for instance, very early in the morning, and again about three o'clock P.M. One of the most important points to be practised, during the "breaking period," is disbudding the vine. By this, practical men mean, as a general principle, removing all the barren shoots. This is, however, too sweeping advice for the inexperienced, as there are sometimes ulterior objects in view besides the crop of the present year. Blanks may have to be supplied, or a peculiar course of training carried out, to effect which, shoots must, of course, be reserved where necessary. Beyond such provision, however, all other shoots may be deemed superfluous, and may be rubbed away the moment it is determined what ought to be reserved.

3. Blossoming Period.—"Stopping," as it is termed technically, is a very important affair in vine-culture, more especially in-doors; without this, all would be confusion. This process might, perhaps, have been dlscussed under the head "breaking." It will, perhaps, be as well, however, to connect it with the "blossoming period." "Stopping," like "slow breaking," tends to equalise the sap, providing the strongest shoots are first operated on, and the others in succession. It, moreover, tends to concentrate the energies of the vine to a given point; thereby enlarging the character of the branch. A distinction must, however, be drawn here, between the "long rod" system and the "close spur," each of which are respectively eligible in certain situations. The chief difference, as before observed, does not consist in the aggregate amount of produce, but in the size of the individual bunches or berries, conjointly with their keeping properties, and the ultimate end in view. If long rods be re-

quired in given situations, in order to carry out a peculiar system of training, it is obvious that "close stopping" must give way. If, on the other hand, the "close spur" system is pursued, then the "close stopping" must be resorted to in the great majority of cases. The general principles of "stopping" are, to pinch off with the thumb and finger the terminal point of the growing shoots, one or two joints beyond the bunch, as soon as the leaves connected with such joints are somewhat developed. As soon as the blossoms begin to expand, which may readily be known by the delightful fragrance which will pervade the house, some nicety of atmospheric management must take place. In former days it was deemed necessary to provide an unusual amount of atmospheric moisture during the blooming period, accompanied by an increase of heat. It has, however, been proved subsequently, that too much stress had been laid on a great amount of humidity in the air. Mr. Paxton was one of the first to show that such practice was somewhat erroneous, and that the vine, whilst blossoming, was amenable to those general laws which are known to be conducive to "setting," as it is technically termed, in the great majority of fruit trees. The more extended cultivation of what are termed the "shy setting kinds," such as the Tokays, the Damascus, and the West's St. Peters, doubtless, throw some light on this matter. There can be little doubt, that some increase of heat should be allowed at this period, not, however, for the sake of heat alone, but that through increase of temperature a livelier state of atmosphere may be maintained. Now, by a lively atmosphere, we mean one in which there is a constant motion, or a continual ingress and egress of air. Atmospheric moisture must not, however, be left out of the question, for that constant egress which promotes circulation or motion somewhat disperses the moist air, and an adequate replacement must be provided. Let it be also remembered that the stamens and pistillum of the vine are enclosed in a sort of Macintosh envelope, and that atmospheric moisture, as well as heat, is necessary to burst their bonds. The best advice we can give, is to apply atmospheric humidity in profusion from three or four o'clock P.M. until sunrise; then, by a liberal circulation of air, to disperse the accumulated moisture, providing thereby for the free dispersion of the pollen; and keeping during the time a thermometer at 70 degs. artificial heat, or as much as 80 degs. maximum solar heat.

4. THINNING THE BERRY.—This is a process requiring a nice hand, especially in forced grapes. Thinning cannot be commenced too early, providing a real berry can be distinguished. It is well, however, in shy setting kinds, to wait until they are of the size of very small peas. All the interior berries should be cut away, taking care to leave the extreme points if beauty of bunch be desired. The distance of

the berries apart must be regulated in the main by their size, as also whether they are required to hang long on the tree. If for the latter purpose, they should be thinned so that no two berries could be said to touch in a general way when full swelled. We are perfectly aware that it may be urged that the bunches will not "dish" so well. There is some truth in this; but such a trifling point should give way to keeping principles, which are sometimes of much greater importance. The Hambro' is one of the worst to "dish" when over-thinned; the Tokays will always lay firm, as will also the Frontignacs. As a general maxim, we would say thin liberally but progressively: it may be done at three distinct periods: first, thin away the crowded berries in the interior of the bunch; secondly, "set them out," as it is termed, that is, form the character of the bunch; and thirdly, go over the bunches when the berries are as large as pease, when superfluous berries will be readily seen. Take care that a fine-pointed pair of scissars is provided, and that they work easily in the joint. Some persons steady the bunch while thinning by holding a condemned berry in the left hand; others use a smooth and pointed stick to separate the shoulders. Whatever mode is adopted, much care is necessary, and neither head, hand, nor scissars, should be allowed to gall or chafe the berries. If such accident occur, cut the berries away at once.

5. First Swelling of the Berry.—We come

now to a period when much care should be exercised in controlling atmospheric irregularities. It is well known that sudden depressions of temperature are not favourable to either size, colour or flavour in the berry. Now although, the vine in Syria, or any other country where it flourishes, may have to endure a temperature of from 86 to 90 degs. during the swelling period, it is obvious that the same amount ought not to be allowed in Britain, under a somewhat artificial course of treatment. Light is the great desideratum, and if there be one axiom of greater import than another, in gardening, it is this: regulate your heat by the amount of light. In this stage of the vine we would advise an artificial dry heat of 65 degs. in February, 70 degs. in March, and 75 degs. in April and May, maximum. As night heat during the same period, we would say, 55 degs. in February, 60 degs. in March, and 65 degs. in April and May, minimum. Let it be understood that we here advise three temperatures on the assumption that, during the day, at least, a circulation or lively motion in the air is maintained, especially until the latter part of the afternoon.

Atmospheric moisture must be well looked to, and nicely balanced; not sudden guests of steam, but a permanent supply from an unfailing source; and here it must be confessed, that our hothouses are in general lamentably deficient. And here it is that a source of bottom heat from tan, or other fermenting matter within the house, is found so very congenial to the swelling of grapes. It is, however, of much importance to gain air very early in the morning, especially if much moisture has been confined during the night; we have no doubt that rust and other evils are frequently engendered by the morning sun, acting on a stagnant atmosphere. Syringing has many advocates during the first swelling. We, however, say, if all other appliances are right, there is no real necessity for it, and it certainly damages the "bloom," as it is termed. A somewhat close system of stopping should be pursued during the first swelling; always, however, allowing some of the uniform shoots to ramble occasionally a joint or two in order to prevent the back or main buds from bursting; as also to encourage action of root.

6. Stoning Period.—As soon as the berries have completed their first swelling, which may always be known by their size and by their becoming stationary, the "stoning process" (as it is called by gardeners) commences. During this period a little more rambling may be allowed to take place, more especially in parts of the house where there is room for more healthy foliage without shading the principal leaves. The same atmospheric management may be pursued as in the former period; if any difference, let a still freer circulation of air take place. The season will

be now somewhat advanced, and every opportunity should be seized of shutting up much solar heat in the afternoons of sunny days. The thermometer may be allowed to reach 90 degs. by these means, from three or four o'clock p.m. until six or seven in the evening, on such days taking care to apply much atmospheric moisture with it. Still, however, persist in an early ventilation the next morning, giving a little air as early as six or seven o'clock. Dispense with fire heat whenever solar heat can be thus enclosed, and resume it as soon as the glass descends below 70 degs.

7. Second Swelling.—Little can be added peculiar to this stage, excepting that the atmosphere in general must be of a drier character; not so dry, however, as to cause undue perspiration in the leaf. A somewhat closer system of stopping must be again had recourse to, in order to concentrate the energies of the vine in the neighbourhood of the fruit. Give very free ventilation, avoiding, however, wind. Do not remove any laterals with the idea of throwing sunlight on the berry: this is one of the most erroneous ideas in vine culture. The berries will always swell much finer under shade than in sunlight; the colouring, and, of course, flavouring, process being accomplished through the medium of healthy and abundant, yet uncrowded, leaves.

8. Ripening.—As the grapes acquire full matu-

rity, and are completing their colouring process, they require abundance of air, with a dry atmosphere. No water need be thrown about at this period, unless much artificial heat is used, and then in moderation. Let it be borne in mind that slow, or rather steady, ripening conduces to flavour and colour, whilst the converse holds good of hurried ripening. We are persuaded that the latter, more especially great night heat, has been much concerned in the shanking and shrivelling of grapes; and that much lower temperatures, accompanied with a free circulation of air, ought to be allowed at this period. When the grapes have attained their full colour, or nearly so, then we advise a partial removal of laterals and superfluous shoots, This should, however, be accomplished progressively. When grapes are intended to hang long on the tree, the latter process is sometimes better omitted; at least, enough should be left to shade the berries, as sunlight will, of course, hasten their maturity.

9. Preservation of Fruit.—The preservation of the fruit for a long time on the tree is one of the nicest parts of vine culture. This, however, in July or August, and November and December, becomes a very different process. In the summer months it is merely keeping a free circulation of air and as low a temperature as possible. Some gardeners, for special purposes, shade their vines when the fruit is quite

ripe: this is, however, a serious matter, and can only be justified in very special cases. All such shading is at the expense of the ripening of the wood and the energies of the tree in the ensuing year. With regard to ripe grapes in November and December, fire heat must be had recourse to, in order to carry away all accumulating damps, and to prevent the temperature from descending too low. Too great a depression of heat will induce a state of rest; too much heat will hurry them through this stage. We have found, by experience, that an average of 45 to 55 degs. will suit better than either a higher or a lower temperature; unless, indeed, as sometimes happens, that the leaves have ripened and are shed; then, indeed, 35 degs. will suffice, providing damp can be expelled by such a temperature. Fires should be kept going early in the morning, accompanied with a free circulation of air, more especially if somewhat dry, and free from fogs. The house may be closed towards two or three o'clock P.M., with the exception of a very little back air to permit the egress of steam during the night. The West's St. Peter's and Hambro's are by far the best for any late purposes; and the fruit should be thinned, as before observed, so that no two berries touch. They should be examined with the scissars at least once a week, and berries removed the moment that the slightest decay is visible.

10. Ripening the Wood.—This is, of necessity,

almost entirely involved in the preceding section; a few features may, however, be presented in relief with advantage. In the first place, the importance of this part of the subject is, we are sorry to say, much underrated. When we take into consideration the character of atmosphere that prevails in some of the vine-growing countries, together with the enormous temperature that at times prevails, it will appear evident that this process is seldom overdone in Britain. The vast difference between unripe wood and wood which is thoroughly ripened is more than people commonly imagine. Those who have been much accustomed to pruning, however, are perfectly aware of the much superior hardness, as well as much less amount of pith in the wood of the latter. An experienced vine-pruner may, by these points alone, guess at the amount and character of the produce for the ensuing year. He can also discover, if the wood is particularly firm, of a round character, and possessing a very small proportion of pith, that the border is pretty safe, and that there has been a permanent action of root through the previous season. It need scarcely be urged here, that this process cannot be carried out without much heat, and this of rather a dryish character.

11. Rest Period.—Not long since, practical men insisted that vines must be frozen to ensure a proper rest. Such ideas are now completely repu-

diated. That a small amount of frost will not be prejudicial, providing the wood is thoroughly ripe, and is cooled down by degrees, we do not doubt; a temperature of 32 to 40 degs., however, as a general maxim, will be found everything that is requisite, providing the root is right, and the top management in the preceding summer as here detailed. Above all things, let no tyro in vine-culture expose the stems of his vines suddenly to a thermometer indicating 10 degs. of frost; more especially if just in the commencement of the rest period, or at the termination of it. Vines in doors, even without fires, can scarcely suffer without a very severe frost. Those, however, recently removed from the hothouse, or pine-stove, should always, when placed outside, during the months of December or January, be covered immediately with mats or litter.

12. Border Management, Renovation of Bad Borders, &c.—The first maxim we *would* here lay down is, providing the borders are rightly constructed, never allow any garden tool, whether spade or fork, to be used in them. There are exceptions in all matters, we know, but, in the present state of garden affairs, when so much meddling of this kind is in practice, we would rather content ourselves with giving prominence to the rule. Our maxim is, as soon as the leaves are falling or crumbling from the vine, to apply what manure is necessary as a top-

dressing. How often have we seen stable and other manures lying in badly constructed stables or fold yards, during November and December, with their properties washing away with drenching rains, and which might as well have lain over the vine-roots during the same period. If a border is well drained, of a good texture, and more than a foot in depth, all the rest may be accomplished by top-dressing for very many years. Top-dressing, in the rest season, may be laid on any thickness, according to the wants of the vines, from six inches to two feet; the latter depth, however, is seldom requisite. One point of caution is here necessary, viz., that the chief body of this top-dressing be removed when the roots are in action. Admitting this to be in April or May, its place may be supplied by a little rotten manure, or half-rotten vegetable soil, about two inches thick; this will ward off extreme drought, and encourage a new layer of surface roots.

In old borders the chief fault is stagnation. This may be caused in two different ways. First, by the inefficiency of the drains, either improperly disposed at the first or choked up by age in some portion or other. Secondly, by derangement of texture in the soil; and this undoubtedly constitutes the great majority of the complaints. Now, even a border made of loam, unless what is termed sandy loam, if 2 or 3 feet in depth, would become in time too much closed up to suit the natural habits of the vine: how much more, then, a 3 feet-deep border, in which decomposing organic matter constitutes nearly one-half its volume. Every body knows that this black and fatty humus—for such it becomes by age—does not, in its own nature, contain sand sufficient to ensure, at all times, a speedy transmission of moisture, and to secure permeability to the atmosphere, especially if buried nearly a yard in depth. Now, although it is impossible to correct the texture of the whole body of the soil thoroughly without breaking it up, it is quite in our power so to ameliorate its character as to ward of the necessity of the latter expensive measures for several years. The first thing to be done is to examine the whole course of the main drain, if there be one; if not, to establish one without delay. The next is to take advantage if any gaps may exist in the border, through the decay of old vines, and where, it may be, one is about to be planted, and to introduce in all such places cross drains, reaching from the house frontage to the main, which we are supposing runs parallel to the frontage, at the extremity of the border. These cross drains should be well secured, and filled, to within 9 inches or a foot of the surface of the border, with open rubbly matter. If such chances of introducing cross drains are not sufficiently frequent, the next best plan is to open deep holes or "pots" in every possible situation, without offering much damage to the roots, fairly down to the drainage or subsoil, and to fill these "pots" with the same rubbly materials as the drains. After these things are accomplished, it would be well to fork in a dressing composed of lime rubbish, charcoal, coarse sand, and bones, &c., on the surface, not going deeper than 6 inches, unless there are no roots in the way. Finally the border may be coated over with 3 inches of manure from the stable door, if to spare. This, however, should only lie from November until Midsummer; it might then be removed and dug into the celery beds, and an inch or two of old vegetable soil, or decayed linings, be substituted in its room.

POT-CULTURE.

WHERE there is no early vinery, the culture of grapes in pots is a most valuable system, though, from the facilities it offers to the gardener of making good deficiencies apprehended at any time in his produce of forced grapes, it is desirably practised in many establishments where both early and late vineries are maintained.

The first impulse given to fruiting vines in pots was by a paper in the *Horticultural Register* for 1831, by Mr. G. Stafford, then gardener at Willersley Castle, in Derbyshire, and which at the time elicited much surprise. It has since been most successfully practised by Mr. Mearns, Mr. Spencer, gardener to the Marquis of Lansdown, at Bowood; Mr. Elliott, gardener at Rudding Park, near Gainsborough; and other eminent horticulturists, whose combined information we will here arrange, previously observing, for the sake of those who are inexperienced in pot culture, that the cultivation of vines under the "coiling system," and of those established in pots, differs in some respects worth notice. The "coiling" system proceeds on the assumption that the buds on the ripened cane are already formed for fruit, and that they only await a development under favourable circumstances. With regard to those established in pots, the difference is that they possess already a good root, equivalent to the demands of the branches the moment they are in action: the latter, therefore, do not require precisely the same management as the former.

Now, it is obvious that until roots can be formed by the coiled canes, any undue excitement in the atmosphere must be at the expense of the concentrated energies of the cane above the soil; at least, in our ordinary atmospheres. This points at once to the necessity of a bottom heat much in advance of the atmosphere. This is found to be the case in practice, and much of the success with coilers must ever depend on this circumstance; in fact, by taking care that no undue excitement or perspiration take place, as to the portion of the coil above the surface of the pot. It may be urged by some that such treatment is immaterial: let it be remembered that the average amount of ground heat is well known to be several degrees in advance of that of the atmosphere in most parts of the globe. The average, however, does not alone suffice to establish the fact that such a power exists in nature; what we want to know chiefly is the greatest disparity—at what ratio it advances, and, when at its height, the condition of vegetation. As bearing on this point, we would make a quotation from the *United Gardeners' Journal* of January 16, 1847. The subject (p. 40) is the "Potato disease at the Cape of Good Hope." The writer, Mr. R. Smith, of The Oaks, South Africa, affirms, from experience, that the soil there, at the hottest period in the year, frequently reaches 130 to 140 degs. at two or three inches in depth. Mr. Smith does not state the temperature of the atmosphere at that period—a circumstance rather to be lamented. However, there can be little doubt that the thermometer would scarcely advance beyond 100 degs., and would perhaps be somewhat between 90 and 100 degs.

And here we would direct attention to the amount of atmospheric moisture necessary. This, with regard to the coilers, can scarcely be exceeded by ordinary means. Let it, however, be remembered, in these tank-heating days, that a confined tank does not produce the amount of atmospheric moisture which the old tan beds did; unless some provision be made for the escape of atmospheric moisture in the sides of the chamber containing the tanks, and which must, to produce an equivalent to the tan bed, be permanently supplied with water.

When the coiled canes are well rooted, it may perhaps be necessary to remove them from the bottom heat, as few can afford to appropriate a pit or house entirely to them. Now this, if rendered imperative, is a serious matter. The only advice that can be offered under these circumstances is, to do it by instalments; that is to say, begin by raising the pots an inch or two out of the plunging medium. In another week they may be placed on the surface, and in a few days after removed to any house which will carry out their forcing process. In such a case, it would be well to let them get rather dry previously to removal from the bottom heat, and to apply liquid manure the moment they are placed in their fresh quarters. Mr. Burns, whose practice is here quoted, sets his pots on moss; and where atmospheric moisture is somewhat deficient the plan is undoubtedly good.

We come now to the consideration of those established in pots; and here the process is rather more simple. These can dispense with the bottom heat if they have a good volume of root; although, be it understood, that an advance in bottom heat of 5 to 10 degs. in the earlier stages would undoubtedly be beneficial. The same process of stopping during growth, &c. apply here as in the treatment of vines trained in hothouses. Little need be added, therefore, on this head.

We must here be permitted to observe that, after all, much—very much—of the success in all these cases must ever depend on the way in which the vines are potted. Drainage is the first essential; secondly, texture of soil; thirdly, quality. In regard of drainage, nothing can exceed a mixture of broken crocks, small lumps of bone (boiled), and lumpy charcoal. There is no real necessity for having the pots so large as Mr. Burns recommends; in fact it would be extremely inconvenient to many persons. There is, however, little doubt that a bushel pot will excel a half-bushel one in amount of produce—all other matters being equal. It may, nevertheless, be safely affirmed, that a pot of about 14 inches diameter, and the same in depth, is, under good cultivation, capable of perfecting of from four to six pounds of Hambro' grapes. More than this, undoubtedly, may be produced; we speak, however, of high-flavoured and well swelled berries.

Next in order comes texture and quality of soil, or in other words, compost. If a system of applying liquid manure is to be pursued—and it ought to be—

there is no necessity to add so many enriching materials to the compost, in the shape of manures. For, be it understood, that these, in decomposing, are more liable to fitful and pernicious extremes than mere soils. Manures, therefore, are not to be relied on as to their texture in this affair, and the preservation of a proper texture is a question of paramount importance. We would here urge a reliance, for the most part, on chopped turf, which, combined with a system of liquid manuring, will be found equal to any complicated compost. However, if manure be used, let it be a mixture of horse and cow droppings, in a half decomposed state, adding thereto half rotten leaves; these, when blended, may form about a fourth of the mass. Let not, however, boiled bone and charcoal be forgotten. The charcoal made by some gardeners is probably superior, for this purpose, to the best charcoal, being, for the most part, of an intermediate character, between charcoal and mere wood ashes.

We must here be permitted to revert to the character of the loamy turf. If this be procured in March, when dry, and piled up in an outhouse or shed, it will be what gardeners term "mellow" in the October following, and chopped down small with the spade, without riddling, will be in excellent order for this purpose.

We now come to the last consideration, viz., quality. This, as we have stated beforehand, can be supplied to any extent necessary, by the judicious application of liquid manures, properly prepared and applied. And here some caution is necessary, for it must be admitted that the character, as well as mode of application, of such powerful stimulants, are not so well understood as they will be hereafter. Enough is known, however, to build successful practice on, and we will here describe the kind and mode of application, which we have found to answer. It may be stated, in the first place, that no application of this kind will answer long, if applied in a turbid state, for it will defeat, after a few applications, the fundamental principle of all good potting, viz., so to prepare, or compound, the ingredients of any compost, as to ensure, for a great length of time, the free percolation of fluids through the mass, and by consequence a free admission of atmospheric influences. This being premised, a good liquid manure may be made, by mixing guano with water, after the rate of two ounces to a gallon of water. To this, add stale urine of any kind, and clarified soot water. The two latter articles we apply indefinitely. Let it, however, be remembered that this forms a most powerful manure, and if applied without dilution will destroy vegetation. Our present practice is to merely colour the tepid water with it, adding about half-a-pint to a large water-pot. This we have found to answer well, and is probably within the bounds. However, if an error, it is one on the safe side, and it will yet require much more experience to say how much farther it may be carried, but we know, from long practice, that nothing is gained by over-strong doses; they occasion a sort of vegetable dyspepsia, which shows plainly that nature's bounds have been exceeded.

Mr. Spencer, of Bowood, however, a clever and most experienced gardener, goes a much greater length in the liquid manure way. Mr. Spencer recommends the Black Hamborough, and the Muscadine and Sweetwater, for early work. We quite agree with him. Those who are not in a hurry, however, will do well to try the Muscat of Alexandria; this, although much later, will be found to succeed admirably. The Muscat is a vine that will not bear such a close "stopping" system; and many of the failures in the cultivation of this prince of grapes are to be attributed to this close stopping, or, in other words, to the want of more foliage.

Having made these preliminary observations, we will now proceed to a further detail of the various stages in this mode of culture.

Raising Plants.—This is done either from eyes, or from shoots coiled within the pots, or from layers.

By Eyes.—Procure eyes (or buds) of the required kinds, from some known good bearing vines, taking care to have the wood perfectly hard and ripe, with the eyes prominent and round; leave about an inch oı wood attached to each bud, and longest at its base. If the vines are intended to be fruited the next season, the eyes should be potted in 32-pots, placing them one inch below the surface, and using loam of a light turfy nature, or if stiff, adding a portion of half-decayed leaves; only one eye must be planted in each pot. This should be done early in February, and when finished the pots containing the eyes may be plunged in any pit or frame that may be at work, where a bottom-heat can be maintained of 90 degs. or thereabouts. They may remain there until growth has commenced, when sun-light being indispensable to the welfare of the young plants, they should be placed (if they were not previously) as near the glass as possible, sinking the pots as the plants reach the glass, but still keeping a steady bottom-heat, and supplying them with air every day if possible; the heat of the frame or pit varying from 60 to 90 degs. in sunshine. When the pots are filled with roots, which will be sometime in April, they may be transferred at once into their fruiting-pots, which should be twos or fours, according to the strength you wish your vines to attain, bearing in mind that those in the smaller size will ripen their wood earlier, and consequently be available for forcing at an earlier period than the others. For compost, use two-thirds turfy loam, from a down having a chalky bottom, and one-third decomposed night-soil. Should the loam be strong, use the same proportion of half-rotten horse-droppings. The turves in the loam should only be half-decayed, and used as rough as possible. (*Gard. Chron.* 1844, 195.)

By Coiling.—This system, we believe, was first suggested by Mr. Mearns, and the practice is thus particularized by Mr. Elliott—

Take a shoot of sufficient length, with good bearing wood at the extremity; all buds to be carefully removed from that part to be coiled into the pot, say seven or eight feet in length, leaving about three feet of bearing wood; in size, the pot from 12 to 14 inches in diameter, and well drained; the soil, fresh turfy loam direct from an old sheep-walk close upon the lime-stone, with a little of a more sandy nature added, well chopped up and mixed together; some of the roughest turfs put over the drainage, and the rod coiled in; when filling up the pot the soil to be well pressed down, especially against the coil; when finished, and the stem tied to a stake, the pot to be sunk into a dry border, and protected from the extremes of the weather, until introduced to the forcing-house, when the pot must be plunged up to the rim in a bark bed ranging from 87 to 97 degs. while the atmospheric temperature must be kept from 40 to 50 degs. to prevent evaporation; the stem to be covered loosely with moss, and kept always moist by syringing with cool water; by this process a little assistance to the stem may be derived by absorption. From the high temperature of the medium into which the coil is plunged the vital energy is strongly excited, and the speedy emission of vigorous roots is the natural consequence; the more slow and gradual the evolution of the buds the better: and here is rather a critical point, viz., the proper time for disbudding; if delayed too long, too great a surface for respiration and transpiration is exposed for the yet limited absorbing powers of the young roots, and if performed too soon the action of the system is paralysed. Upon examining the pots, should abundance of rootlets be found, the atmospheric temperature must be raised by degrees, as with established vines. The moss must not be removed until the fruit is set, and then all is safe. (*Ibid.* 1841, 749.)

By Layers.—Mr. W. Stothard, gardener at Chantrey House, in 1841, gives these directions:—When the vines that are let into the house have reached the top of the rafters, instead of stopping the leading shoot, as is commonly done, and often too soon, which causes the eyes to burst, and renders them useless for the succeeding year, turn the shoot back, and having ready a pot of suitable size, well drained and filled with fresh turfy loam and rotted dung, in equal parts; place it upon the back shelf or wall of the pit, and as soon as the young shoot has attained a sufficient length to be laid into the pot, cut out two or three eyes, and as many of its leaves, and scrape off a little of the bark the whole length of the part intended for roots, which is bent into the pot, and covered with mould six or seven inches. No attention is required, excepting to train the shoot as it advances in growth, and to keep the mould in the pot a little moist, to encourage the emission of roots, which will appear in a fortnight or three weeks, and soon fill the pot. When the shoot is laid in the pot, allow it to grow from four to eight feet long, according to the strength of the parent vine, to which leave it attached until it has done growing, and perfectly ripened its wood. Should there not be a sufficient quantity of leaders, place pots under the rafters at most convenient situations, and likewise on the front flue; but the shoots that are laid in these pots never suffer to exceed five feet in length. When the plants are severed from the parent vines, put them out under a wall where they are protected from frosts, and take into the house as required for forcing; at that time shift into pots about a foot over and fourteen inches deep, to remain until the fruit is cut, after which they may be thrown away, sure of a fresh supply of plants every year by the same process. (*Johnson's Dict. Mod. Gard.*)

After-culture.—The fullest information on this head is the following, furnished by Mr. Spencer—

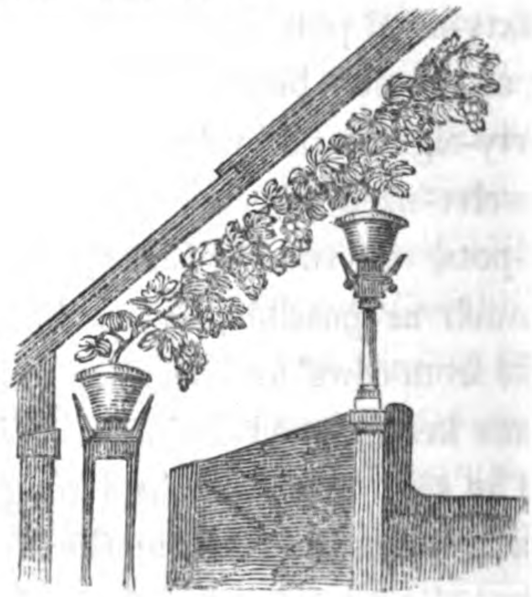
After potting, the plants should be placed in some house or pit where a temperature from 60 to 80, or 85 degs. is maintained; they should also be so arranged that the shoots, as they advance, can be trained immediately under the glass, and be exposed as much as possible to the light. The front kerbs and back shelves of pine-pits are suitable places, and the partial shade that the vines afford benefit the pines during three or four of the summer months. Where there is only a vinery, they may be trained between the permanent vines, or in any other place where the cultivator can make room for them. As the shoots advance, train them carefully, and stop the laterals as they appear. When first potted, the plants will want but little water; but it must be gradually increased as the pots become filled with roots; they will then require it regularly during their growth, and manure-water may occasionally be given, although the quantity they demand the first season is small in comparison to what they require afterwards. The most suitable length of cane for pots is from four to six feet; but if, from any peculiarity in the house, in which they are to be fruited, a longer length may be required, they should be left accordingly, as the vine will grow strong enough for fruiting, eight, or even ten feet long. After it has grown a foot more than the length required the next season, it should be stopped; three or four of the upper laterals, however, may be allowed to grow at a few joints, to prevent the topmost eyes breaking. Manure-water may now be applied to cause the buds to swell, and care must be taken to preserve the principal leaves, as they are now performing a most important part in regard to the crop next season. When the wood appears to be turning brown (or ripening), water should only be applied to prevent the vines flagging; the laterals should be taken off, and every means employed to ripen the wood perfectly. Indeed, if it is not convenient to allow a large admission of air when they are growing, it would benefit them much by removing them to a cool house, where they would have the benefit of more, and a lower temperature at night. By the beginning of September, if the former directions have been followed, the vines will be ripe enough to place out of doors. The north side of a wall is the best place, and the pots should be laid on their sides, and every means taken to throw the plants into a state of rest; the cultivator will thus find himself in possession of vines which, for strength and vigorous habits, may justly be mistaken for older plants. If the above mode of obtaining fruiting vines for one year should be thought too troublesome, from the plants requiring bottom-heat during their first stage, the eyes may be planted singly, as before, in 48-pots, and set in any house or pit where there is a little heat; they will be longer, however, by this method, in developing their roots, and may not want shifting into larger pots before May or June, when the plants may be moved into 24's, in which they may remain through the season, in any house or pit in which room can be found for them, paying attention to watering, tying up, &c. They may be stopped when two or three feet high; and when the wood is fully ripened, removed out of the house, and plunged in any material out of doors that is a non-conductor of heat. In February, or March, cut these plants down to two or three eyes, shake them entirely out of the pots, and place them in similar sized pots to fruit in as the former ones, taking care to spread their roots (in potting) regularly through the soil, that when the growth commences, each spongelet may be in immediate contact with food; this is a much better practice than placing them in a pot without disturbing the ball, as is often done. The same routine of management must be followed with these through the season, as recommended for the others. From the larger amount of organisible matter the vine possesses by this mode of treatment, they will generally be found stronger than those raised the same year, and they possess the advantage of ripening their wood earlier in the summer. (*Gard. Chron.* 1844, 212.)

The next consideration is the time when you wish your grapes to ripen; this being ascertained, it is easily known when forcing ought to commence. It may be stated, that vines under the above-mentioned treatment will be ready for forcing early in November, and consequently will ripen their crop by the end of March. The precise mode in which the vines are to be fruited depends on the kind of houses the cultivator has at his command; a flued pit answers well; but the best description of house is that which admits the rays of the sun to pass through it in the winter, at as near right angles as can be. Such a house, admitting considerably more light during the winter months, is much more suitable for such a plant as the vine than low flat houses. Whatever the house is, if not perfectly ready for the vines when you wish to begin forcing, get them placed in a dung frame, where you can give them a moist heat of 55 degs.; this will cause their buds to swell regularly, and prepare them for their removal to the fruiting-house, when ready, without losing time. Previously to losing their leaves in the autumn, they may be disbudded on Roberts' system, leaving a few more buds than you want bunches; but one objection to this system is, that if by any accident, through the winter, the bud should get injured, it leaves a blank which, had the next buds remained, might easily have been supplied. The number of bunches that may be left on each vine will depend on the soil, size of the pot, &c. When the vines are strong, and No. 2 pots are used, leave six or seven bunches on the Hamburgh, the same on the Sweetwater, and one or two more on the Muscadine. If the vines are not so strong, four or five bunches on the Hamburgh will be sufficient. It is much better to have rather fewer bunches, and the berries fine and well coloured, than ill-coloured puny bunches, which always is the case when too many are left on the vine. The vines, when placed in the house, presuming their buds to be swelled, must have their temperature raised from 55 degs., fire-heat, to 65 degs. when in bloom, and it will be better if this degree of heat, by night, is never exceeded; of course, on all days when there is no likelihood of sun-heat, the heat of the house should be raised 5 or 10 degs. by artificial means. Air should be admitted every day early; this is of consequence, or the leaves are apt to get damp, and their texture being so extremely thin, when the hot sun and drying winds of March act on the foliage, they often burn and shrivel, and consequently are unable to swell off the fruit or give it colour. During all the time the vines are in a fruiting state, manure-water, in some shape or other, must be frequently given. Dung-water is made of various ingredients, but in whatever way it is made, it ought to ferment before using, and should be applied in a pure state, and at a temperature equal, at least, to that of the house. The draining from farm-yards is always good and safe. So is manure-water, made by pouring nearly boiling water on equal parts of sheep's or deer's dung, and fresh horse-droppings, fined by a lump of fresh lime, drawn off clear, and when used diluted with equal parts of rain water. A very weak solution of guano is beneficial, but great caution is required in using it. It is astonishing, during the period of active growth, what an immense quantity of dung-water vines will take. If the dung-water is properly cleared and diluted, it may be given twice for fresh water once; when the grapes are fully swelled and beginning to colour, water must be more sparingly applied, using clean water only. The flavour of grapes is often spoiled by being over-watered when ripening their fruit, by the proportion of carbon and water, which constitutes the saccharine matter in grapes, being destroyed, and water formed in excess. When the fruit is ripe, if the house is wanted for other purposes, the plants may be removed to any dry house or room, where the grapes will keep until wanted. The varieties Mr. Spencer finds best for early forcing in pots are, the Hamburgh, Dutch Sweet-water, and Muscadine. The small-berried varieties, as the Esperione and others, are hardly worth growing, compared with the above. Muscats, and all the delicate sorts, as the Frontignan, answer admirably later in the season, and thus the amateur, and those who possess but a small extent of glass, may cultivate all the varieties of grapes procurable in British nurseries, at but a trifling additional expense. Where the cultivator prefers boxes to pots, they may be used, from 14 to 16 inches square, which will be quite large enough; they can be packed on shelves more closely together than pots, and are more handy to move about. By the above process, grapes may be procured by the end of March and April, without interfering with those planted outside. (*Ibid.* 1844, 228.)

As the practice of Mr. H. Burns, gardener, at Tottenham-park, differs somewhat from that of Mr. Spencer, and affords, besides, some useful details of practice, we subjoin the particulars he furnishes, though by no means approving of his system of frequent shifting. He says—

Set the eyes in thumb pots on the first of Febuary, putting moss about two and a half inches deep on the flue at the back of the pine pits, and place the pot upon it, keeping the moss always moist. As soon as the bud or eye has become well furnished with roots, repot into sixty-sized pots, and continue afterwards to shift as fast as the pots become filled with roots; from sixties to forty-eights, thirty-twos, twenty-fours, sixteens, and twelve-sized pots successively; and lastly, into bushel-pots, or tubs. Encourage rapidity of growth as much as possible, by feeding with liquid manure made from cows' and deer's dung; and during the whole time keep a good drainage at the bottom of the pots. The soil, three-fourths strong turfy loam and one-fourth horsedung; from the linings of the pine pits select the most decayed parts of the manure.

Allow the shoots to run to the extent of thirteen eyes, and then stop them. By the middle of September the wood becomes ripened, and then prune them back to the ninth eye, and remove them from the pinery to the open air, setting them under a south wall, on bricks placed edgeways, so as to admit free drainage. On the first of November take in the required pots for forcing; after they are washed with soft soap and sulphur. After all the eyes have shown fruit, select from six to eight of the best bunches to remain, and pluck off the others, never allowing one eye to bear more than one bunch. Syringe the vines gently with warm water three times a week, and water them with the liquid manure. Should they, however, occasionally require more moisture, give them nothing more than soft water about milk warm. Mr. Burns fruits annually from 100 to 120 vines, taking in after the first fifty the rest in succession.



The preceding sketch represents a transverse section of the vinery, with bed for tree leaves to decay and heat; framework for the support of front trough, sixteen inches wide at top, and ten inches deep, and the wire under the rafters on which the vines are trained. (*United Gard. and Land Steward's Journ.*)

Preparation for Forcing.—Mr. Arkwright proved that vines, of which the wood and fruit have ripened late in one season, will vegetate late in the following season, under any given degree of temperature; and Mr. Knight has shewn the converse of this proposition to be equally true; the plants under each different mode of treatment requiring a period of rest, during which they regain their expended excitability. A Verdelho vine, growing in a pot, was placed in the stove early in the spring, where its wood became perfectly mature in August. It was then taken from the stove, and placed under a north wall, where it remained till the end of November, when it was replaced in the stove; and it ripened its fruit early in the following spring. In May it was again transferred to a north wall, where it remained in a quiescent state till the end of August. It then vegetated strongly, and shewed abundant blossom, which, upon being transferred to the stove, set very freely; and the fruit, having been subjected to the influence of a very high temperature, ripened early in February. The plant retained its foliage till April, and would not be prepared to vegetate again till late in the spring. This experiment will probably succeed well with those varieties of the vine only which produce blossoms somewhat freely, and are of hardy habits; but abundant crops of fruit of these may be obtained at any period of the winter or spring by proper previous arrangement of the plants, and by the application of a higher or lower degree of temperature. (*Knight's Papers*, 288.)

Size of Pots.—The smaller the pot, consistent with healthful vegetation, the better, not only because less room is thus occupied, but because the smaller development of root required, the earlier will be the production of ripe fruit. In using bushel pots or tubs there is no doubt that Mr. Burns used a size needlessly large, and we have no doubt that the largest size required are those nine inches in diameter by nine inches deep. We know this from having seen it successfully practised, and vines grown in them bearing five noble bunches, commencing from within eight inches of the soil. Our opinion is further sustained by the authority of the late Mr. Knight, who has stated that—

A pot containing a quantity of mould, equal to a cube of 14 inches has been found large enough for a vine whose foliage occupied a space of 20 square feet; water holding manure in solution being abundantly given. And Mr. Knight states, he saw grapes acquire a larger size, and other fruits a higher flavour, under such management than under any other. (*Knight's Papers*, 255.)

DISEASES.

The diseases afflicting our grape vines are chiefly confined to their fruit, and we conclude that they are caused by the vines being over-stimulated to production at an unnatural season, without there being secured to them either a due supply of sap, or a favourable atmosphere to ripen in. The probability is, that a chief source of the maladies is the absence of an accordant temperature of the soil and the atmosphere; for grapes grown in the open air are liable to none of the diseases which afflict them under glass.

Shrivelling of the berries of the grape in stoves appears to arise from the roots of the vine not supplying a sufficiency of sap, as well as from its not being duly elaborated in the leaves. This occurs if the roots are in a cold soil, or are vegetating in an outside border, the temperature of which is too low compared with that of the stove. In the first case, thorough draining and the incorporation of calcareous rubbish; and in the second case, protection to the border and stem, will remove the evil. If the sap be not duly elaborated, it must arise, either separately or conjointly, from the leaves vegetating in an ungenial atmosphere, or from their being too reduced in number. In either case, we consider with Dr. Lindley, that a deficiency of organizable matter is the consequence; and such deficiency is a satisfactory explanation why the disease occurs. It must never be forgotten (says the authority just quoted) that plants, like animals, consist of two essentially distinct parts; the one the organised material of their structure, the other the organizable matter out of which additions are to be made to that structure; and that under no circumstances whatsoever can growth take place, except in the presence of the latter. This law is not only one of the foundations of vegetable physiology, but one of the most important of all facts for the gardener to bear in mind, explaining as it does the sources of success or failure in multitudes of the operations in which he is engaged. (*Gardener's Chronicle*, 1843, 709.)

Shrivelling, or rather the withering of grapes produced from weakness, is a very different disease from shanking. *Shanking* takes place almost as quickly as a tree withers when struck by lightning, but shrivelling is much more gradual in its advance, and occurs, at first, without any disease appearing in the footstalks of the berries. The other symptoms are, that after the berries are formed they advance pretty rapidly in size until the period when the seeds are forming; for a time their increase then seems suspended. Immediately after this, the footstalks, sometimes, suddenly turn brown and shrink, and the berries, ceasing to increase in size, shrivel, acquire an unpleasant taste, and ultimately fall off. (*Trans. Hort. Soc.* vi. 25.)

If the roots of the vines are found to have penetrated the soil deeply, they should be lifted very carefully, brickbats placed beneath the roots, and these trained about nine inches beneath the surface. If drainage of the border has been neglected, let it be effected at the same time. If the loss of the crop which would be occasioned by the lifting of the whole of the vines would be inconvenient, only one or two can be so treated in successive autumns. The most injurious time for an unnatural disparity of temperature in the air and soil to occur is at night; for, as was justly observed by the late Mr. Knight, an ill effect of high temperature during the night is, that it exhausts the excitability of the tree much more rapidly than it promotes the growth, or accelerates the maturity of the fruit, which is in consequence ill supplied with nutriment at the period of its ripening, when most nutriment is probably wanted. The Muscat of Alexandria, and other late grapes, are, owing to this cause, often seen to wither upon the bunch in a very imperfect state of maturity; and the want of richness and flavour in other forced fruit is often attributable to the same cause. (*Knight's Papers*, 216.)

The Frontignans are among the varieties apt to shrivel under great disparity of temperature between the roots and branches. This disparity will be lessened by not commencing forcing this grape so early as usual. (*Gard. Chron.* 1841, 73.) But the legitimate mode of obviating the evil is by taking care that the soil of the border is preserved in a due temperature.

Somewhat allied in its causes to shrivelling is that unsightly imperfection where the berries do not come to maturity at the apex of the bunches, leaving from five to ten quite colourless and sour, though others on the same bunch are fine and large. In such case the remedies are to give more heat and air, keeping the border warmer than before, and to avoid cold damps in the house; leave as much foliage as can be exposed fully to light. The leaves removed must be by little at a time. In thinning, clip off a few berries at the lower extremity of the bunch; the rest will swell better.

Shanking is an ulceration, or gangrene, attacking the footstalks of the bunches, and appears to be occasioned, like shrivelling, by the temperature of the soil being too much below that in which the branches are vegetating; and, consequently, the supply of sap to the grapes is too much diminished, and the parts which thus fail of support immediately begin to decay, this is an effect always the consequence of a diminished supply of sap, apparent either in the leaves, flower, or fruit. The disease, like every other putrefaction, does not advance rapidly unless there be much moisture in the atmosphere.

The coldness of the soil causes this torpidity in the action of the root; and this, perhaps, at the very period when the greatest demand is made upon it to sustain the excessive perspiration which is going on in the leaf, and to furnish fresh matter for elaboration; to both which ends it is frequently quite inadequate, owing to drenching rains. If the young fibre be examined at such inclement periods, it will be found somewhat discoloured; and, in some cases, quite rotten. This is not to be wondered at when the habits of the plant are duly considered, and the difference estimated between a vine on the slope of a rocky surface in the south of Europe or Asia, with six inches of soil, and one in the cold northern clime of Britain, in four or five feet of rich soil, every breathing pore closed with a kind of alluvium. If shanking were caused by sudden depressions of temperature, why should it not occur more frequently on walls out of doors, where the thermometrical changes are at least as great as in doors? Yet here it seldom occurs, and here again the border is seldom so deep, so rich, or so far below the surface level, as some of our hothouse borders, many of which contain material sufficient for thrice their extent. (*Hort. Soc. Journ.* i. 52.)

We cannot but think, in re-examining this subject, that shrivelling is chiefly caused by an insufficient supply of the pabulum necessary to sustain uninterrupted progress in the berry. It does not follow, however, that it must, of necessity, be a case of non-elaboration. It more frequently arises, in our opinion, from torpidity of root, brought on by various causes; amongst which, as chief, may be named the cold and continuous rains of wet periods during the growing season. Such, acting on borders already become too close, and "sour" through age, and imperfect texture, produce utter stagnation, if not destruction of fibre, at the very period when the greatest demand is made on the root. How can such end otherwise than in debility?

Shanking, we conceive, is generally caused by the unnatural disagreement of temperature between the root and top, independent, in the main, of the question of moisture. It generally occurs with vines which have been somewhat forced; seldom on open walls—seldom with vines forced in pots or tubs. The obvious prevention of shanking is securing a congenial relative temperature to the roots and foliage.

Rust.—This disease, affecting the berries of the grape, comes in the form of a rough, rusty appearance of their skins, which have, in fact, become thick and indurated. Some think it arises from their being handled, or the hair of the head touching them; but the disease is often too general to admit of this topical explanation. We believe it to arise from an overheating of the vinery, however unintentional, whilst the grapes were young, and thus tending to force them to a premature rapidity of growth. Any excessive pressure upon the cuticle, whether from within or from without, causes its thickening. This considerable elevation being succeeded by as sudden reduction of temperature, will almost certainly induce the disease.

One writer thinks that this, or whatever causes the rust, occurs whilst very young, for he states that he never saw grapes with this disease, but dark spots were to be observed on the bunches before they were in bloom. He adds, that if the diseased berries appear to have a more oily appearance, until nearly the size of a pea, and the pollen adheres to them as dust does to anything fresh painted, whether syringed, thinned, or not, there is nothing will prevent them from having the rust that season. (*Gard. Chron.* 1842, 805.) We can only say, that we have not observed these phenomena, and that we are convinced, if the temperature to which the bunches are exposed is not subjected to sudden vicissitudes, the rust will not appear upon their berries.

The Spot affecting the berries seems to be the same disease as shanking, only affecting a different part. Like this disease, it is a gangrene, and is probably occasioned by an irregularity in the supply of moisture and vicissitudes of temperature, but especially if one of the extremes is much below the degree of heat most favourable to the healthy growth of that plant. The reason of this is very obvious. If any plant be placed in a highly stimulating heat, and is abundantly supplied with root moisture, it immediately increases its surface of leaf and fruit. If this amount of sap is subsequently suddenly reduced, by lowering the temperature, and adding water to the soil less freely, the increased surfaces are no longer required, and it is a law pervading all the vegetable creation, that the moment any of the parts of a plant are unnecessary to it, that moment they begin to decay. We placed a plant of the Marvel of Peru, or Heliotrope, in a high temperature and abundant moisture; these were then much reduced, and the leaves in a few days were completely decayed round their edges, and in spots upon their surfaces. The extent of leaf was accommodated to the amount of sap to be elaborated. (*Princ. of Gard.*)

Muscats are particularly liable to the spot. Our opinion that sudden vicissitudes of temperature are the causes of this disease, seems to be well sustained by the fact, that the parts nearest the glass, that is, the upper portions of the bunches, and those parts most exposed to the sun's influence, are the first to suffer; and this, also, goes far towards substantiating the assertion, that the shade of the foliage is necessary to the well-doing of grapes. (*Gard. Chron.* 1843, 505.)

Want of Colour is often a defect of the Black Grape, but not at all necessarily arising from deficient light. The green colour of leaves depends entirely upon the presence either of light or of uncombined hydrogen gas, but vegetable reds, purples, and other colouring matters of fruits, are formed, though less intense, even in a total absence from light. So far from full exposure to light being requisite for the full colouring and ripening of grapes, they never attain these desired qualities so well as when shaded by one thickness of leaf. The colouring matter of all fruit is dependent partly upon the leaves immediately above it, and partly upon the fruit itself; the necessary digestion of the sap being commenced in the one, and perfected in the other. If this digestion or elaboration of the sap is checked by ungenial temperature, but more particularly if the crop is too heavy for the vine, or if the leaves, especially above the bunches, are too much thinned, defect of colour will be the very usual consequence to the berries.

Let it not, therefore, be assumed at any time, that want of colour is caused by the want of sunlight to the berry. We have seen the blackest of berries in situations where the sun had never shone on them since they blossomed : indeed, it only requires a little close observation for one season to dispel such a fallacy. It sometimes, however, happens, that the principal leaves on the same shoot with the bunch are shaded by other main leaves, or by laterals ; such shading is sure to be prejudicial to the colouring of the berry, as well as to the maturation of the buds connected with the shaded leaves. And here we have one of the reasons for such close stopping as the vine is subjected to.

Over-cropping, alone, will lead to bad colouring; indeed, is one of the most fruitful sources of it. It exhausts the tree of every particle of prepared sap, and produces a kind of debility in the root, which renders it readily susceptible to the stagnating rains of an unpropitious season.

In order to promote good colouring, the ripening process should not be hurried. It is evident, that very high temperatures are not required for this purpose, for the Black Hamborough, on common walls, is not deficient in colour, in a good season. Now the colouring process, in the latter case, occurs in the end of September, when the temperature at night must sometimes be near the freezing point. It is a common observation of practical men, that the cold nights of autumn hasten maturity in many crops;

and this is undoubtedly a fact, and traceable, we presume, to a cessation of the growing principle; causing, thereby, a concentration of the energies of the plant. We would say, therefore, beware of too high a temperature during the colouring process, unless accompanied with much solar light, and even then avoid extremes. We would more especially avoid night heat at this period, and would promote a circulation of air night and day.

Warts, or *Blisters,* on the leaves, occur to the cells of the under surface, immediately beneath the cuticle, which become much elongated and multiplied, with a vertical arrangement, the cuticle being sometimes wholly, sometimes only partially, obliterated. The leaf is discoloured and withered in consequence of the absorption of the neighbouring chlorophyll by the diseased and multiplied cells. It is very difficult, in the present state of our knowledge of the diseases of plants, to say what is the cause, and consequently to assign a remedy. Though so strongly resembling one of the epiphyllous fungi outwardly, it is of an entirely different nature. (*Gard. Chron.* 1844, 320.)

The probable cause seems to be excessive moisture to the root, which induces a large supply of sap to the leaves faster than they can dispose of its moisture by transpiration; ruptures of the vessels, and contortions of the parenchyma, are the consequence. Good drainage, and an atmosphere not too moist, would remove, probably, the evil.

Bleeding.—This only occurs to the vine, from the unhealed surfaces of cuts made after the sap has commenced its motion, and before the leaves are well expanded. A red-hot iron, applied to the bleeding surface until it be charred, will stop the effusion of sap for a time, if not permanently, and to effect a complete stoppage at once, coat the charred surface, and rub well into it, a paste made of lime newly burnt and grease. This hardens and forms an effectual plaister.

Two other plaisters have been suggested; the first of which, by the late Mr. Knight, we know to be effectual, but of Sir John Sebright's we have had no experience.

One fourth of calcined oyster-shells, beaten to fine powder in a mortar, and three-foruths of cheese, worked together, until they will form a sort of paste; this mixture pressed into the pores of the wood, either with the thumb or any other means, will effectually stop the flow of the sap; sometimes a repetition may be necessary, if it is not well forced into the pores. (*Hort. Trans.* i. 102.)

Sir John Sebright's cement consists of four parts rsein, one part bees-wax, and one part fine brick-dust, melted and well mixed together. The mixture is to be applied whilst hot and liquid. (*Gard. Chron.* 1844, 280.)

Erineum vitis is the name of a very minute fungus making its appearance very often on the leaves of the vine in places where, from wounds or other causes, extravasated sap occurs. It is in the form of yellow, woolly tufts. We are not aware of its occuring so abundantly as to be injurious to the vine, and it would be destroyed probably by the usual sulphur fumigation.

INSECTS.

The vine is subject, under bad cultivation, to be attacked by every genus of insect that infects the hothouse. In the open air no tree is less liable to insect ravages.

Acarus tellarius, the Red Spider, is one of the vine's in-door enemies. It generally resides and breeds on the underside of the leaves, and the infested leaves are very distinguishable as soon as they are thus attacked; for the insect wounds the fine capillary vessels with its proboscis, and this causes the upper surface of the leaf to appear full of very small dots, or spots of a light colour. When the Acari are very numerous, they work a fine web over the whole under-side of the leaf, as also round its edges; and it is curious to observe, that they commonly carry this web in a straight line, from one angular point of the leaf to another, on which boundary line, in a warm day, they pass and repass in very great numbers. They do not confine themselves to the leaves only, but attack the bunches of grapes also, especially at the time when they are almost ripe; and as they extract the juices from them, the grapes soon become flabby, and ill-flavoured. (*Speechley*, 171.) The Red Spider connot thrive—scarcely exist—where a sufficiency of water is regularly applied. As, however, syringing cannot be persisted in at all times, something else is requisite at those periods, when the syringe is laid by. Sulphur, then, is the best thing at present known for this purpose; but as many persons are deterred from the use of it, through a fear of its pernicious effects, we will here detail our mode of using it, by which we have been kept (we might almost say entirely) free of this pest for the last twelve years. We apply it about three or four times in the course of the year, to each house; the houses are on the average about thirty feet long, by some sixteen feet wide, and we use about six ounces to each house each time; applied in the form of thick paint. The houses are heated by hot water, and the sulphur paint is applied to the under or return pipe alone. The best way is to beat a lump of soft-soap, as large as a walnut, up in warm water; and to add some clay water, made by working a lump of clay in warm water until the water becomes a thin paint; then to blend this with the soap water; and finally to mix the sulphur also. The soap and the clay form a body, and prevent the sulphur washing or rubbing off. This application, then, with the proper use of the syringe, as detailed in the calendar—the regular washing of floors, twice a-day at least, with the moistening of walls, shelves, or other bare surfaces—keeps us entirely free from the Red Spider. And, be it observed, that this is the greatest enemy of the vine we have; no one can get proper colour or flavour, whilst this robber of the elaborated sap is allowed to suck that life-blood of the tree.

The occurrence of the Red Spider is greatly checked by washing the stems and branches of the vine at the end of the forcing season, aud again before forcing is commenced, with the following composition:—Put 4 lbs. of flowers of sulphur, 2 lbs. of tobacco, $\frac{1}{2}$ lb. of soft soap, and 4 ozs. of powdered nux vomica, into five gallons of boiling rain water; stir them until well incorporated, and apply with a brush whilst warm.

Mr. Speechley's directions are these:—To 1 lb. of flowers of sulphur put 2 oz. of common Scotch snuff (very good tobacco dust will answer equally well); let these be well mixed together; then take a small brush, such as is used for common painting, dip it lightly in the sulphur, then lay one hand on the upper surface of the leaf, and with the other draw the brush very gently backwards and forwards all over the under side: by this means a little sulphur will be left on the leaf. The Acarus being soft and delicate in its nature, is destroyed with the most gentle touch. The brush also most readily wipes off the web, as well as the globular transparent eggs, which are, by a fine membrane, fastened to the leaves ; and thus we are secured from the danger of a succeeding brood. This process may, to some, have the appearance of a tedious operation ; and, indeed, when vines are injudiciously trained, it certainly must be attended with great trouble ; but it is very easily performed upon vines trained in the regular method here set forth, and a single operation is generally sufficient for a whole season. (*Speechley*, 175.)

Aphis vitis, the Louse, Puceron, or Vine Fretter, sometimes appears upon the young shoots of the vine, but these grow so rapidly that we never observed any injury caused to them by this insect. It is speedily destroyed by tobacco fumigation.

Coccus vitis.—The vine scale preys upon the stems and branches of the grape vine, both in the open air and under glass. It seems to be the same species which also attacks occasionally the peach, nectarine, and plum. It is, says Mr. Curtis, a longish brown insect, which in old age assumes a blackish brown colour, and becomes hemispherical and wrinkled. The females are shield-like, being convex above and flat or concave below; they are furnished with six small legs, which, when the insect is old, become part of the substance of the body. On the under side of the insect is a sucker, with which it pierces the cuticle of the plants, and extracts their juices. Soon after impregnation the female dies, and her body becomes a protection for the eggs, which are covered with long white wool, and sometimes completely envelope the shoots of the vines, or of plants, growing underneath them. The males are furnished with four wings, and are apterous. Their powers of propagation are immense; and, where they once become very numerous, they are exceedingly difficult to eradicate. This species belongs to the true genus Coccus, characterized by the female having a scale inseparable from her body. While young, both sexes are alike, but the male larvæ produce two-winged insects, with two tail threads. The females have no wings, and their dead bodies, beneath which the young are sheltered, appear as in the annexed wood-cut.

Coccus adonidum, the Mealy Bug, feeds on tropical plants, with which it has been introduced into our hothouses, especially *Coffee, Cestrum, Justicia, Canna, Musa, Renealmia*, &c.; but it also is very injurious to the vine and pine-apple; though it is of much rarer occurrence than the *C. vitis*. The female is not shield-like, as is the preceding, but more resembling in form the woodlouse. Being reddish, though sprinkled over with a white dust, it has been mistaken for the Crimson-tinged Pine Bug. The body of the female is divided into twelve segments, and these have small tubercles at their sides. The male is gnat-like and slender, with two broadish wings, and two long brush-shaped tail filaments. This scale insect may be removed with a soft brush, and easily killed by washing with soap-suds.

Coccus hesperidum, the Orange Scale Insect, sometimes, though still more rarely, appears upon the vine. It attaches itself both to the branches and leaves. The female appears like an oval, nut-brown shield. Both the male and female are represented magnified in the accompanying sketches.

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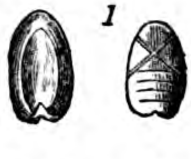


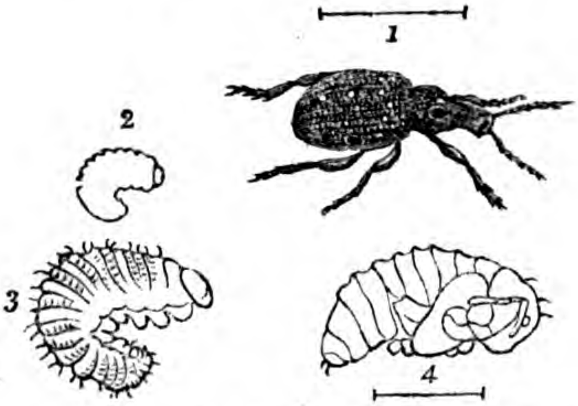
Whilst the leaves are on the vine, if any species of scale appears on its stem and branches, the least offensive remedy is to paint over the whole with a strong solution of gum arabic or starch; allow it to remain on for a week, and then wash it off. But the most effectual remedy is to brush them over thoroughly twice, after an interval of a day, with spirit of turpentine. To prevent the recurrence of the plague, a very effective mode in autumn is, to scrape away and burn all the rough bark, and then, with a rough brush, to paint over the stem and branches with a creamy mixture of clay, lime, soft-soap, flowers of sulphur and urine.

Another formula, quite as effective and less disgusting, is this:—$\frac{1}{2}$ lb. of soft-soap, 1 lb. of sulphur, and $\frac{1}{4}$ oz. of black pepper, to 4 gallons of water, boil together for 20 minutes, and make it thick enough to adhere to the wood like paint. If it does not, thicken it with lime, adding sufficient soot to take off the glaring white colour of the lime. The proportions are of little consequence, the object of this and similar washes being, by adhering to the wood, to prevent the eggs or larvæ of insects from coming to life. (*Gard. Chron.* 1842, 840.)

Curculio (Otiorhynchus) sulcatus is by far the most injurious vine weevil, and every means should be used to prevent its increase in vineries. They eat the margin of the leaves into all sorts of shapes. The weevil always feeds in the night, hiding itself by day under the leaves or loose bark of the vines, or in any similar place, to avoid the light. Advantage may be taken of this habit to destroy it, by placing a handful of moss here and there among the branches of the vines, by way of trap, and into this it always retires at the approach of day. The moss to be taken down and examined every morning, and the insects found in it killed. Another species (probably *C picipes*) often causes the failure of grafts by eating the buds just as they are bursting into shoots, when, if the season be adverse, or the graft too weak to develop an adventitious bud, it, of course, dies. Both species suddenly drop to the ground if disturbed, when, either from the instinct of self-preservation, or from being stunned by the fall, they lie as if dead, and being nearly the colour of the earth, they are difficult to discover; caution is therefore necessary in catching them. (*Ibid.* 1841, 325.)

Curculio sulcatus, as described by Mr. Curtis, is a dull black weevil, with a stout proboscis, at the extremity of which is the mouth; the thorax is granulated, and the elytra are rough, with several elevated lines and minute ochre-coloured dots placed somewhat transversely; it has no wings. The period for the appearance of these weevils depends upon temperature, for May is mentioned by some, and June by others, as the months when they are mischievous in gardens, and in hot-houses much earlier. Mr. E.

Edwards says that he has seen them in an early vinery at Studley Castle about the end of January, when they make great havoc amongst the young shoots and foliage; and from that time until the end of April they feed upon the buds and leaves, always high up, and are never seen in the day. They will also eat the leaves of the peach, and have been known to attack the fruit. The eggs are deposited a little beneath the surface of the earth, and produce white maggots, and these live at the roots of the vine, rendering the plants weak and sickly; some say that about June the maggots change to pupa, whilst others state that they live through the winter, and undergo their metamorphoses in the spring; however this may be, they remain in the chrysalis state only 14 days. The maggots also do great mischief to succulent and other plants in pots, as well as in the border, such as Sedums, Saxifragas, the Trollius, Auriculas, and Primroses, eating round the tops of the roots and detaching them from the crown.



1. The Weevil. 2, 3. Maggots. 4. The Pupa. The straight lines show the natural length of the Weevil and Pupa.

Curculio picipes is a most destructive insect in the vinery as well as in the garden. This beetle is very similar in figure to *C. sulcatus,* but smaller, and forms, with about twenty other indigenous species, a genus called Otiorhynchus; they are also nearly alike in sculpture, but vary in tint, *C. picipes* being of a clay-colour, the wing cases more or less clouded with darker-coloured spots, and altogether it so much resembles in tone the clods and bark under and between which this insect secretes itself by day, that it is with difficulty detected. In the night these weevils sally forth to feed upon wall-fruit trees and the vines in hot-houses, either attacking the stems of the new wood in April, which soon becomes black, or feeding near the tips of the shoots.

Every crevice in old garden-walls often swarms with these weevils. Nothing would prove a greater check to their increase than stopping all crevices, or holes in walls, with mortar, plaster-of-Paris, or Roman cement; and the interior of hot-houses should be annually washed with lime; the old bark of the vines under which they lurk should be stripped off early in the spring, and the roots examined in October, where they exhibit any unhealthy symptoms from the attacks of the maggots of C. sulcatus as soon as the beetles appear; sieves should be held at night under the branches and leaves, when, by shaking them, the beetles will readily fall into the sieves, but as they drop down when approached, this operation must be proceeded with gently and quietly; multitudes may be thus collected, both in and out of doors, and if the person who carries the light has a pail or jug of water, the sieves can be emptied into them, as occasion may require; but when the beetles are eventually destroyed, boiling, not warm water, must be used, as the hardness of their horny covering will resist a considerable degree of heat. When the larvæ are ascertained to reside at the base of a wall, salt might be freely sprinkled, which will kill them as readily as it will the maggots in nuts; strong infusions of tobacco-water, aloes, and quassia, are also recommended. Where the blood of animals can be obtained, it might be beneficially applied, as it would coagulate over the tender larvæ and pupæ, and set them fast in the earth. (*Gard. Chron.* 1841, 292.)

Thrips.—This minute insect belongs to the same genus as that (*Thrips physapus*) which tickles the face so intolerably during the sultry weather of our summers. The thrips sometimes attack the young shoots of vines growing in the open air, especially those of weak vines, or vines newly planted. If young shoots chance to receive any injury by late spring frost, the tender part of the leaf will immediately curl up and change to a dark brown colour; and in this state the thrips generally attack them with great greediness, especially the white Sweetwater and white Muscadine kinds. The thrips, however, are seldom injurious to vines growing in the open air, except in the spring; and to those in the hot-house, they are most hurtful when the grapes are nearly ripe. They attack the bunches as well as the leaves, and commonly prey upon the extremities of the berries, but more particularly at the end next the foot-stalk. In white grapes, the part of the berry injured changes to a dark colour, the foot-stalk turns black, and the berry withers. (*Speechley*, 172.)

Fumigation, with tobacco smoke, is the most effectual mode of removing this marauder from the vine. For a house, 43 feet long and 11 feet wide, 1 lb. of tobacco is sufficient; take an old wire basket, containing a few hot cinders, put the tobacco on them and hang the basket up in the house; then blow it with bellows until it is well lighted, then raise steam in the house by any mode most convenient. The tobacco will keep burning until it is all consumed. The steam keep on for about an hour, in which time the plants are covered with dew, which is well mixed with tobacco smoke. Repeat this on the following day, using only half-a-pound of tobacco. Those who have not got the means of steaming the house from a boiler, will find a trough, with small holes pierced in the bottom, fixed over the hot-water pipes or flues, a very good substitute. Enough of steam will be generated in this way in one hour to cause a fine dew on the plants; if the house or frame can be covered during the operation, so much the better, as it will prevent the steam from condensing on the glass, and also keep the tobacco smoke from escaping through the laps in the roof. (*Gard. Chron.* 1844.)

In other parts of the globe there are other insects which are very serious depredators upon the vine. There is a singular beetle, common in Hungary, (*Lethrus cephalotes*) which gnaws off the young shoots of the vine, and drags them backward into its burrow, where it feeds upon them; on this account the country people wage continual war with it, destroying vast numbers. Three other beetles also attack this noble plant: two of them mentioned by French authors (*Rynchites Bacchus* and *Eumolpus Vitis,*) devour the young shoots, the foliage and the footstalks of the fruit, so that the latter is prevented from coming to maturity; and a third (*C. Corruptor, Host*) by a German, which seems closely allied to Otiorhynchus picipes before mentioned, if it be not the same insect. This destroys the young vines, often killing them the first year; and is accounted so terrible an enemy to them, that not only the animals but even their eggs are searched for and destroyed, and to forward this work people often call in the assistance of their neighbours. In the Crimea the small caterpillar of a *Procris* or *Ino* (lepidopterous genera separated from *Sphinx*, L.) related to *I. Statices*, is a still more destructive enemy. As soon as the buds open in the spring, it eats its way into them, especially the fruit buds, and devours the germ of the grape. Two or three of the caterpillars will soon so injure a vine, by creeping from one germ to another, that it will bear no fruit, nor produce a single regular shoot the succeeding year. Vine leaves in France are also frequently destroyed by the larva of a moth (*Tortrix vitana*) ; in Germany another species does great injury to the young bunches, preventing their expansion by the webs in which it involves them, and a third (*Tortrix fasciana*) makes the grapes themselves its food : a similar insect is alluded to in the threat contained in Deuteronomy xxviii. 39. (*Kirby and Spence's Entomology*. i. 204.)

Field Mouse. Mr. Fleming, at Trentham Hall, finds this little animal attacks the inner bark in severe winters. Gardeners, therefore, should see that it is not harboured by the dung on the borders.

USES.

All the products of the vine are of some service to man, though their employment, in many instances, has been superseded by other preparations. Thus verjuice, the juice of the unripe berries, has been banished from our pharmacy by the introduction of Citric Acid, the acid ingredient of the lemon. Vinegar, however, (Acetic acid) is still made from the fermented juice of the grape, and Tartar (Tartrate of Potass) a mild cathartic, is also obtained from its lees; and the actual sap of the vine has been recommended as beneficial in calculous disorders, and as a coryllium. The leaves and tendrils have been administered in hemorrhage and other cases requiring styptics; and the wood grows to a size in more eastern countries, that render it available in the constructive arts, and its durability and toughness are very great.

The seeds of grapes have been discovered to be an excellent substitute for coffee. When pressed, they first produce a quantity of oil, and afterwards, when boiled, furnish liquid very similar to that produced from coffee. The practice has become very general throughout Germany. (*Mechanic's Magazine.*)

The employment of grapes as a dessert fruit needs no further particularizing; and when dried they appear upon our tables in the form of currants and raisins.

A very delicious preserve or jelly, also, may be made from this fruit, and is prepared as follows :—Pick off the grapes; put them in a stewpan or saucepan; bruise them very slightly; set the pan over a slow fire; and as the seeds rise to the top while simmering, skim them off. When dressed enough, pass the whole through a coarse muslin or cloth; sweeten it to your taste; return it again to the pan, and let it simmer very gently till quite thick; put it in a mould or preserving-pot; and, if properly made, the pot may be turned upside down without disturbing its contents. Put thin paper, moistened with a small quantity of salad oil, over the jelly, and cover with paper or bladder. Keep it in an airy, light, and dry place. It is impossible to state the proportion of sugar required, for situation, season, &c. make so great a difference in the saccharine juice of the grape, that it is better to leave it to the taste of the maker. Skim off as many of the seeds as possible before pressing, as too many of them will give a bitter taste to the jelly. (*Gard. Chron.* 1846, 645.)

To keep bunches of grapes in good condition for dessert long after they have become ripe, several plans have been devised, but of which the following are the best.

Mr. Speechley recommends that, before the autumnal frosts have killed the vine leaves, let the bunch with the shoot be carefully cut off the vine.

Then put the lower end of the shoot into a bottle filled with water. Hang up the bottle with the shoot and bunch in a warm room. A green-house is a very proper place. Only two or three joints of the shoot above the bunch should be left, but a sufficient length below to reach the bottom of a quart bottle, will be required. The bottle should be filled with fresh water every twelve or fourteen days; and at the same time a thin shaving should be cut off the bottom of the shoot, whereby the pores will be made to imbibe the water with greater facility. By this method grapes have been kept fresh and good till the middle of February. (*Speechley*, 27.)

A still better plan is that detailed by Mr. G. Watson, gardener, at Newton Vicarage, near Stockton-on-Tees. He directs, when, in the last week in December, or first week in January, the latest house of grapes, which are ripe in September, is pruned, that then the whole of the grapes remaining shall be cut off, with a joint or two, or more, of wood below each bunch. Make a clean cut, and apply sealing wax as hot as can be used to it, and seal the wood closely, so that no air can enter the tissues communicating with the bunch. Then hang the bunches up on cords, suspended across a closet in a cool airy room, taking care that they do not touch each other, and after this they are cut down as wanted. In this way the White Muscat of Alexandria has been kept until the latter part of May; of course, the berries were slightly shrivelled, yet not so much as they would have been had they remained on the vines. To succeed, much depends on the situation where the grapes are preserved; they must not be exposed to a current of warm air, nor yet be so damp as to cause mould. (*Ibid.* 1841, 662.)

The best position in which to suspend the bunches, is the reverse of that in which they hang upon the tree; that is, with the stalk-ends downwards, for the berries are thus better kept from pressing against each other, which is an unfailing cause of mouldiness.

In all cases bagging, by checking evaporation, and excluding insects, promotes the preservation of grapes. It is true, that the preparation of the bags, in the first instance, may be a little troublesome, but when first made, and properly taken care of, they will answer the same purpose for years. They should be made of fine cotton, of various sizes, and prepared in such a manner as to be easily taken off and put on again, if necessary. When thus protected, the fruit will retain its flavour and continue in good condition for a considerable time, even on the open walls, provided the weather is dry and favourable.

Important as are many of the already enumerated purposes to which the fruit of the vine is applied, yet are they as nothing when compared to its value for the wine press. We are no disciples of Dr. Whitaker,* but we are equally far from being proselytes of Father Matthew, and although the use of wine, like that of all other good gifts, may be abused, yet we never saw sufficient cause for concluding David was wrong when he gave thanks to God for "wine which maketh glad the heart of man," or that St. Paul was erring when he bade his fellow workman "to use a little wine" to strengthen him under his infirmities.

* Dr. Whitaker published in 1638, "The Tree of Human Life, or the Blood of the Grape," and there expresses his opinion that the name, *Vinum*, is derived *à vi* from its strength, or, perhaps, *quasi divinum*, because it is a species of the tree of life in Paradise. The intention of this curious little book is to prove that, by the judicious use of various wines, life may be prolonged from infancy to old age without disease.

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