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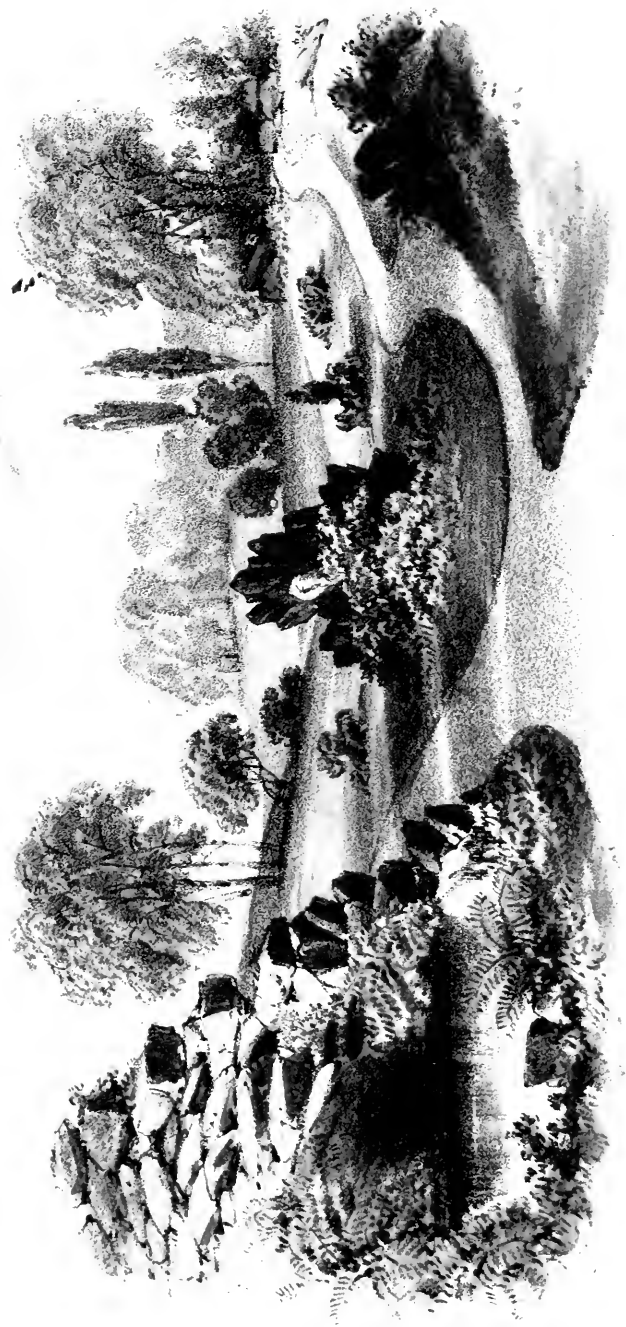
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GLENNY'S, MANUAL

OF

PRACTICAL GARDENING;

CONTAINING

PLAIN AND AMPLE INSTRUCTIONS
FOR EVERY OPERATION CONNECTED WITH THE CULTURE
OF THE GROUND,

INCLUDING

LANDSCAPE GARDENING.

BY GEORGE GLENNY, F.H.S.

EDITOR OF THE "GARDENER'S GAZETTE," AUTHOR OF "THE PROPERTIES OF FLOWERS AND
PLANTS," "THE HANDY BOOK ON GARDENING," "GLENNY'S CULTURE OF FLOWERS.

"GLENNY'S CULTURE OF FRUITS AND VEGETABLES," "GLENNY'S GARDENER'S
EVERY-DAY BOOK," ETC. ETC.

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P R E F A C E.

THE success which has distinguished the “Hand-Book to the Flower-Garden and Greenhouse,” and the “Hand-Book to the Kitchen-Garden and Orchard,” both of which are being revised for further editions, suggested the propriety of providing a Manual of Practical Gardening, comprising plain instructions for all the operations necessary in the culture of the ground, commencing with draining, digging, and trenching, and going through all the branches and departments of the art or profession. Not that there was any scarcity of books on the subject, but that the books we possessed already were not plainly written,—that they were adapted for the reading of those who knew a good deal already, instead of being written down to the understandings of the million.

The intention of the following pages is, that they should convey to all classes, in language they can understand, the most simple method of accomplishing any task in gardening, pruning, grafting, budding, propagating, sowing, planting, training, &c. ; in short, every operation that is performed is explained so as to instruct the tyro who has to begin to learn. We have, perhaps, been prolix in some things, but we have determined to be understood by persons who have never held a spade. How far we have succeeded will be seen on a careful

perusal ; and we are not without hope that there is something to be learned even by the professed gardener. In this work, as in others that have been successful beyond our expectations, we have confined our instructions to what we have practised. We have ventured no speculative theories, we have borrowed nothing from others ; we have succeeded in the cultivation of nearly every tribe of plants in British gardens, and we have recommended throughout this little book precisely what we have ourselves practised. The laying out of gardens forms an important feature, and landscape gardening, reduced almost to rules which everyone can understand, occupies a considerable portion. We have endeavoured to condense the matter as much as possible, to give full effect to the instructions ;—there are certainly no more words than are necessary to convey our meaning. As a branch of gardening especially belonging to young beginners, we have given some highly useful hints upon the operations which more particularly belong to florists' flowers, the principal of which are treated of in a plain and practical manner, so as to enable even a youth to undertake their cultivation.

INTRODUCTION.



It is too common a practice to introduce new works to the notice of the public with observations upon the deficiencies of those already published. We shall not follow the example; because we confess that, having originally learned a good deal from other authors, and founded the practice which we afterwards improved, upon the information given us by Miller, Abercrombie, and others who have been so often plundered and abused at the same time, by the writers of very sorry imitations, we are too thankful for all they taught us, to employ ourselves in pointing out their deficiencies. Leaving other works, ancient and modern, to their fate, we propose so to arrange the lessons derived from our predecessors as to form a part of the complete system carried out by ourselves, and so to convey the entire lesson as to be understood by the million. The practical lessons of Miller and Abercrombie were sound and good, so far as they went; but no one can deny that the great facilities afforded us by modern inventions,—the vast improvements in particular races of flowers and plants,—the advantages of modern science, and other characteristics of the age, have enabled us to carry out many operations with much less trouble than our forefathers; and that if they were living and writing in our times, they would give us a very different series of instructions to those which have, nevertheless, been so useful. Our object will be to give, as concisely as possible, such instructions as may be profitably learned by all classes, as part of their scholastic acquirements: we do not propose to elaborate upon all the modes of grafting; for many that help to fill up modern treatises are mere whims and fancies,—which, like difficult pieces of music without melody, by astonishing instead of pleasing the hearer, serve

only to show the skill of the performer, which nobody wishes to dispute. Our object will be to give the easiest and most efficient instructions for all the necessary operations in gardening ; not to introduce the novelties which have nothing to recommend them but their novelty.

Gardening is one of those arts which enable us to make the most of nature's gifts. It has been said, over and over again, "He that makes two ears of corn grow where only one used to grow, is a public benefactor." In other words, whoever can increase the produce of the land, does a real service to the country. Gardening, however, takes a higher stand. Its object is not only to increase, but to improve the produce. It is for the gardener to learn from nature what a plant requires, and to supply that in greater or lesser abundance as experiments may dictate ; he is not to conclude that if a plant grows naturally in a damp place, he is to try it in water, nor the other extreme. But there is no small advantage in the present day, that this has been done for the younger branches, by men who have patiently tried experiments, and learned by their failures, as well as by success, what is the best means of accomplishing an object ; and that nearly all that can be known, and quite all that need be known, can be learned from carefully reading the information transmitted from father to son, and handed onwards with the gradual but certain improvements of the age. But it is gaining an object if we can, from experience arising out of actual practice, give in one small volume that which could otherwise only be obtained by reading many works, and especially when we can omit all that is useless, speculative, or whimsical. Nobody can defend those writers who put twenty lessons before a pupil, all different, all professing to accomplish the same end, and without once informing him which are the safest and best, the easiest and most economical. Young gardeners, of all others, should have no puzzling matters ; their path ought to be as straight as circumstances will admit of. We should think our work but half done, or very ill done, were we to record the useless variety of methods adopted by as many different authors, and leave our less experienced friends to discover which is the best. Yet such has been the character of some of our most popular works on gardening : perhaps twenty authors are quoted, and all of them persons of some note in their profession ; but with all these quotations, the person wholly

inexperienced would be bewildered, while the moderately well-informed gardener would be actually misled. A man's system of pruning may be adapted to the locality, his system of pine-growing may be dictated by peculiar circumstances; cucumber-culture, vine-training, and other very leading features of his vocation may be very complete for him and the means at his command; but take from his system any one department, and give it without fully stating the circumstances under which he does it and advises it, and it only tends to mystify the general practice. The very means adopted under some circumstances successfully, may be fatal under others. Whether the subject be the soil or compost employed,—the time of planting, or potting,—the grafting, layering, top-dressing, or any other distinct operation,—the man's different ways and periods of doing these things may depend on facts which we are not informed of, and should not be brought forward.

It is therefore necessary to caution all beginners against adopting any plan, upon however good an authority, without first being made acquainted with all the circumstances under which such plan was successful. When a man is once master of a sound, practical, and easy mode of management for any subject, he may read all that has been written, and use his own judgment as to any deviation. He is able then to try a hundred experiments, on a small scale, without endangering the general success of his gardening operations; but until he has, under some general system, accomplished his objects up to a certain degree of success, he ought not to be bewildered by twenty opinions, all widely different, upon some main feature, only because the parties who have succeeded with it have had some correspondingly different mode of doing the rest of the business connected with it. In the simple operation of planting potatoes, practical men differ exceedingly. Everything here depends upon the sort of potatoes grown; and the man who says he plants a yard apart, and he who informs us that he plants only two feet, may be both equally right; but suppose a young beginner is only told that Mr. A., a very large grower, plants a yard apart, Mr. B., a grower of equal celebrity, plants two feet apart—the main facts which dictate these different distances are, that one of the parties is writing of dwarf, and the other of a tall-growing kind; now simple as this may be, it

is illustrative of the impropriety of quoting different authors without being able to do justice to their motives.

The great object of all teachers should be to inform men how to accomplish the most with the least trouble and expense ; to inculcate as much as possible simple rules, and general principles, and, so far as may be necessary, to explain why certain operations produce certain results ; but we have no notion that persons entirely unacquainted with botany and the physiology of plants, but desirous of cultivating a garden, should be forced to study the former before they are permitted to grow their own cabbages, or furnish a garden out with a few flowers. Much as may be said in behalf of botany, and of science in general as connected with gardening, facts indisputable prove that it has flourished greatly among the most ignorant and humble classes, who were not only without information, but were so destitute of means, that they pursued their fancy under numerous disadvantages, which called forth their inventive faculties to make all sorts of shifts, to accomplish what professional gardeners have done to their hands. In the department of gardening devoted to florists' flowers, which has advanced much more rapidly than any other branch, nearly all the extraordinary advances in the quality of flowers have been made by poor men, uninformed men, men who did not even know the meaning of botany, and were as strange to the physiology of plants as to the "south-west passage" or the north pole. In such hands the most extraordinary improvements have been made in the races of flowers ; and, to this day, the best raisers and cultivators may be found among men who have the utmost contempt for science, however useful and amusing, and even profitable it may be to those who have sufficient garden to make it worth studying, and time to study it. It is not our object to make the study of botany or chemistry the only road to gardening ; it would be for the most part useless to a poor man, and a round-about way to the object in a rich one. Learn, in as easy a way as may be, to manage your garden ; this can be done in a short time ; botany, chemistry, the physiology of plants, and such-like studies, have but little to do with the general operations, as we have already shown. Nature gives us all the lessons that are required beyond those that may be conveyed in a very plain system of gardening.

The cultivator of a first-rate collection of plants may render

his occupation doubly gratifying by adding the study of botany and physiology; but he can do his duty without; and experience has taught many employers, to their cost, that reading and studying gardeners are the most expensive, the most useless, and most annoying of all men, and merely receive their salaries for amusing themselves, while the foremen and under-gardeners do the work. It is all very well, if a man shall have studied the scientific part of his business in his youth; but the parrot-like acquirements of a great majority of even the reputed first-rate men, who lecture here and write there, and talk everywhere, give one a sad distaste for learned gardeners. The mere book-knowledge which enables a man to pass an examination conducted by theorists, is so easily acquired, and is so utterly irrespective of practical knowledge, that it is quite possible to find such men totally unfit for head-managers; nevertheless, such men do fill places, and, where the employer is ignorant, and the under-gardeners sound practical men, all goes on well, without its being suspected that the good order is owing to the unpretending working-gardener, and that no benefit is derived from the superintendence of the chief. Be this as it may, the advantages of gardening are manifold, and open to all classes; the most ignorant may profitably employ themselves, without losing time over their studies; their cabbages will eat as well, their mignonette smell as sweet, their flowers be as bright, and their fruit-trees yield as plentifully, in their ignorance of science, as though they were professors of the highest grade. In this fact it is that we find so much real benefit; it is this fact that throws open the enjoyment of gardening to the poor industrious classes. It is not necessary that we should find fault with those authors who surround the knowledge they impart with a barrier that shuts out millions; it is enough that we throw abroad all we know for everybody who wishes to pick up. We will not complain that others make the road to enjoyment through thorns and briars impervious to the multitude; it is enough that we open an easier and a better way, through which the urchin at school, and the poorest, weakest, and least informed of our fellow-men, may walk pleasantly, and not have to walk far.

Abercrombie, whose admirable work, called "Every Man his own Gardener," has stood the test of years, and is even now the best of its kind, never made the study of botany the

road to gardening; and he has made more practical gardeners, amateur and professional, than all the other authors put together. Later editions contain evidence that the means of carrying out certain garden operations alter the practice in the higher departments; but still there is no labour necessary to learn the ordinary duties of a gardener; and we have abundance of reasons for our opinion that all men should be gardeners. Gardening should be taught to boys as part of their education. It will be found not only the most useful, but the most safe branch of early education; and whatever may be the business to which a boy may be brought up, no man can answer for his future situation; and, whether at home or abroad, he may find a knowledge of gardening the means of good employment if poor, and of endless gratification if rich. It may be objected, that youth cannot be taught without ample ground to work upon, and practically this is true; but he who is made familiar with the seasons, the terms, the system, and ordinary processes, by means of early reading, rapidly learns the rest, the mere mechanical work; and there can be no question that, if there were the means of teaching this also while a boy was at school, it would be of the greatest benefit to the great mass of the people.

Leaving the usefulness of garden knowledge out of the question for a moment, let us look at gardening as a recreation. Is there any one pursuit equally inviting? Does not the produce reared in a home-garden eat sweeter than any we can buy? Is not a nosegay plucked from our own beds and borders more valued than twenty times the quantity would be derived from another source? No matter whether the superiority be real or imaginary. Half our pleasures are ideal; and it is a happy feeling to esteem that which we have, more than that which we have not. But there is one fact which cannot be disputed: the vegetable that is fresh from the garden is immeasurably superior to that which has been loaded to market, and knocked about four-and-twenty or more hours before use; and although some suffer less than others, such articles as peas, asparagus, sea-kale, spinach, Brussels-sprouts, and all soft cabbages, do suffer very materially every hour they are kept between cutting or gathering and eating. Although, therefore, it is a pardonable vanity to esteem our own growth before any other in all cases, there is a luxury in getting vegetables from the garden immediately before use, which

none but those who have experienced it can know anything about. All soft fruits are the same ; and, therefore, setting all whims and fancies aside, while it is true there is a good deal of ideal pleasure derived from a garden, there is infinitely more real, substantial, unalloyed enjoyment. Our most humble friends may be as proud of a bed of stocks as those a little better off are of a bed of tulips, or the aristocrats of horticulture are of a princely establishment. Our object will be to put the most inexperienced youth into the readiest way of performing all the operations, and thereby pursuing a rational and profitable recreation, or of furnishing the means of earning his living, according as he may have occasion to apply his knowledge.



PRACTICAL GARDENING.



WE propose now to confine ourselves to the operations applicable to all parts of the science of gardening, but not connected with any particular crop—the actual working of the soil, and the manual labour attending the produce of every thing, but treated of independently of the things to be grown. Under these operations we must rank digging, trenching, draining, dunging or dressing, hoeing, raking, sowing, planting, training, pruning, budding, grafting, striking cuttings, layering, &c.

The general application of these operations to peculiar crops must be treated of hereafter; but there can be no doubt of the propriety of teaching everybody the principles which must guide the gardener, and they should apply to all cases and all kinds of produce. First, then, we shall take in their proper order the operations which relate to the general management of the soil, such as digging, trenching, draining, dunging or dressing, hoeing, raking, drilling; next, such as relate to the crops, such as sowing, planting, training, pruning, budding, grafting, propagation by cuttings, layering, &c.; lastly, we shall endeavour to apply these instructions to the leading crops of a family garden.

THE GROUND AND ITS TREATMENT.

As we rarely have a choice of ground, but have to make the best of what we can get, the first thing to be done is to drain it properly, for if this be not done, half our manure and labour will be lost. First, then, seek an outlet for the water, which should be at the lowest part of the ground, and four feet below the surface; let there be a proper drain or an open ditch at

that depth along the lowest end ; and whether it be one or the other, all the other drains, which should be three feet six inches deep, should be in parallel lines leading down to and opening into this main ditch or drain. If the ditch is to be open, it ought to be four feet wide at the top, and six inches wide at the bottom ; but if you can have it covered in,—which will depend on whether you have a good outlet,—let this main drain be made with bricks, three bricks wide laid flat, a brick on edge to form each side, and bricks laid flat across the whole length, but no mortar ; of course, if it be an open ditch there will be no bricks required. At distances one pole, or sixteen and a-half feet from one to the other, open trenches the shape of a V, eighteen inches wide at top, and tapering down to a point, all having a gradual fall to the ditch or main drain. At the bottom of these trenches or drains, round common pipes are to be laid end to end, and if you have any coarse stones or cuttings of hedges or brushwood, lay a foot of one or the other over the pipes, and then return the soil to the trench, which will not hold all of it : the rest must lie in a ridge above the other ground until it settles down. This drain will effectually relieve the ground from all stagnant water, and greatly promote the efficacy of dressing and dunging, and the growth of crops ; but we have given a separate paper on this subject. As soon as you have completed the drains, set to work at trenching the ground all over two spits deep ; that is to say, dig out the earth one spade deep first, and then another spit at the bottom ; and if the second or lower spit of earth be good, let the top be put to the bottom and the bottom to the top. This may be done as follows :—

TRENCHING.

Mark the space of ground for operation two feet wide along the end or across the end of the piece to be trenched ; dig out the soil with a spade, the whole depth of a spade, and wheel the earth to the other end of the work ; then dig a second spit of earth out all over, and wheel that also to the end, but keep it separate from the other. Now mark another space of two feet, and dig it out one spit deep, throwing the soil into the bottom of the first trench, and when that is done, dig out the second spit from the bottom and throw it on the top of the other, so that the first trench will be filled up level, and

the second trench, of the same size that the first was, will be empty. Mark the same distance for opening another trench, and go on putting the first spit at the bottom, and the second to the top till you come to the last empty trench, which is to be filled with the stuff you took out first, putting the first that came off into the bottom, and the second to the top, and thus may a **very large** piece be trenched without difficulty by a very inexperienced hand. But if it should prove, which sometimes it does, that the second spit of earth is not so good as the first, instead of digging out the second spit, dig it up merely, and leave it in the bottom ; the loosening of the soil does an immense good, and the top, being the best, retains its place, being merely turned over in throwing it out of the new trench into the old one. All the way we go on this sort of work the soil has to be levelled and the lumps broken, if there be any. Whatever be the nature of the soil, the removing it and turning it over, to the depth of two spades, is highly beneficial, as it lets the atmosphere into the soil, and promotes the percolation of the rain to a considerable depth.

DIGGING.

This is not generally so beneficial as trenching, simply because in digging we only go one spit deep ; but after being trenched, the cropping time only wants it disturbed one spit deep. For this operation a trench is dug one spit deep, and the stuff removed to the other end of the piece ; a second trench is made by throwing the stuff taken out into the first ; a third made to fill up the second, and so on until all but the last is filled, and this is to be done with the soil first taken out. Digging is required every time we have to plant, to sow, or crop in any way, and the ground requires dunging or dressing according to the state of the soil, and the nature of the crop that is to go in. Digging is the most simple operation in gardening. The spade is thrust into the soil in a sloping direction ; the handle is pushed towards the ground, and the blade or flat part of the spade, acting as a lever, loosens the soil, which is lifted and thrown wherever it is to go ; the spade is thrust in again a little more backward, according to the soil you wish to lift, and in the course of this digging all the lumps of earth are to be knocked to pieces and the surface levelled.

HOEING.

Hoeing generally comprises several distinct operations. With the hoe we stir the ground, draw drills to sow seed in, cut up the weeds, thin out crops, and earth up all sorts of things that require it. The hoe is a sort of cutting blade, put on a wooden handle, the cross way of the wood-work, and is used by pressing it hard on the earth, and drawing towards you, by which means the surface of the soil is disturbed, and the air let into it ; whereas, when rains have run the surface all together, nothing penetrates, the soil is soon heated, and the wet evaporates more freely. Hoeing, therefore, means moving the earth by means of a hoe ; but there are many ways of hoeing, according to the state of the ground to be hoed. If the ground contains nothing but weeds, the hoe can do good by preventing them from seeding, and save future labour ; but stirring the earth among crops, weeds or no weeds, does an immense deal of good ; and besides keeping the weeds down, which it must by disturbing them, it makes a loose surface, which does not absorb so much heat, nor let out so much damp. The hoe is used to make gutters or drills, in which to sow seeds ; and here we have to call in the aid of a line, because, by first stretching a line the length and in the place you want the drill, there is at once a perfect guide. You have simply to draw the corner of the hoe along by the side of the line, drawing out earth to the depth you want the gutter or drill ; and when you have done this, shift your line as far as you want the drills to be distant from each other, and draw a second, third, and fourth, up to as many as you want. The depth of these drills is regulated by the crop you want to sow ; but the process is the same, although large or small hoes may be used for large or small drills. With regard to weeding with the hoe, there is nothing more efficacious. The hoe is thrust in the ground, or rather chopped in the ground, and the surface cut off, with the weeds at the same time ; and the most difficult part of hoeing is when you have to weed small crops with but little room between. Hoeing the weeds up is work for dry weather, because you leave them on the ground to dry up. If, however, it happens that rain comes after they are hoed up, they should be removed from the bed altogether, to prevent their rooting fresh in the soil, which many would. Occasionally this weeding is done at

the same time as thinning out crops, by one and the same operation. Turnips, carrots, parsnips, spinach, and some others, are sown broadcast, as it is called—from cast abroad, perhaps, for the seed is cast or thrown all over the space—and raked in, so that when it comes up with a good many weeds among it, as is always the case, you have to hoe out the weeds, and as many of the young plants as will leave the rest a certain distance apart. Perhaps this is the most difficult operation with the hoe; and there should be hoes to use according to the distance of the crop. For thinning onions, hoes are very small; turnip hoes longer. The last operation we shall mention for the hoe is, to earth up crops; that is, to first loosen the earth to freshen it up, and then draw a ridge of it on each side of a row of whatever vegetable it may be, and so form a bank, as it were, up the stems of the plants. Peas, beans, cabbages, cauliflowers, and almost every description of vegetable, are the better for drawing earth up to their stems, when they have begun to grow well, whether from seed or after planting out; and the hoe will perform this office for anything but celery, which, after the hoe has done all it can, must, for the last few weeks, be regularly banked up by a spade; for it grows often a full yard, and requires earth as far as it is to be blanched.

RAKING.

Raking is performed with an instrument or tool which may be described as a coarse iron comb, set crosswise at the end of a handle, in the same way as the hoe. It consists of a strong iron bar, with iron teeth set from one to two inches apart, and of various sizes, according to the rough or smooth work it has to perform—small ones, with half a dozen or eight teeth, for raking borders between the flowers and plants; larger ones, made stronger, and with eight, ten, or even a dozen teeth, are for heavier work. The rake in a garden is to do the work of a harrow in the field,—level the ground, break the lumps, leave it even, draw off the weeds and stones, rake in and cover seed. It is generally used after the hoe. When the weeds are chopped off, they should be raked into heaps or drawn off altogether. The rake is drawn towards us, and we may be said to work backwards, whereas in hoeing we go forwards, chopping up the weeds as we advance, that the earth we loosen may be left behind us. When ground

is dug, and laid as level as we can dig it with the spade, it would be too rough to sow garden-crops on. It is then that the rake becomes necessary, to lay it tolerably level, and break all the lumps, which is done by turning the teeth upwards, and hitting the lumps with the back. The rake on the borders is as useful as the broom on the paths; for nothing looks worse than dead weeds, decayed leaves, large stones and lumps, which can only be cleared off with the rake.

RIDGING.

This operation is generally adopted when ground is intended to lie idle during part of the winter months. It is merely to leave the ground in ridges instead of filling up level as we go on, while digging it. It is done sometimes to give the frost of winter more hold upon the soil, and to work through it sooner by freezing a larger surface; but unless the ground be stiff, and idle too, it is of less service than cropping it, and on light lands ought not to be done. There was a time when a notion prevailed in favour of leaving ground fallow, but a rotation of crops answers much better, and, rather than let a piece of ground lie idle, it is now the practice to sow it with a crop, and dig or plough the crop into the soil as a dressing. In low grounds, ridging is practised for the purpose of growing things on the top of the ridge, with a view to keeping it drier; the term is also applied to cucumber-growing, when they insert the plant in the open ground; the old gardeners called it ridging-out, although they were planted on the flat ground, but they have been grown on slopes, which were perhaps called ridges.

DUNGING AND DRESSING THE GROUND.

This depends much upon the soil. If stiff and clayey, one of the best dressings is to burn a portion of the soil and spread it over the surface, to be forked in with any stable or other dung you intend to use. The best way to dung the ground is to spread the quantity evenly over the surface, and turn it to the bottom in digging; or, if it be dunged or dressed while trenching, let the dressing be put at the bottom of the top spit, and not deeper.

The most judicious way of dunging or dressing garden ground is, the instant a crop is off, to spread it over the sur-

face, and dig it in one spit deep, there to leave it until the ground is wanted for cropping again, when it will only require levelling or drilling, as the case may be, to receive the plants or seeds without again disturbing it. There is yet another mode of partially applying manure, which is by spreading it over the surface, and allowing it to wash in by the rains. But this mode of application is more adapted to other and more powerful manures, such as bone-dust, wood-ashes, poultry dung, guano and its substitutes, and, generally speaking, all those dressings which require but little in bulk to be given. All sorts of dung intended to be used for manuring the garden should be laid in heaps to rot; for, among other reasons, it lies in a smaller compass, and there is not so much labour in wheeling it on to the ground.

In sowing, it is a practice to use powerful manures in small quantities at the same time—that is, manures prepared on purpose. There are now many preparations to be used as substitutes for natural dungs. Nightsoil disinfected may be purchased in a granular state fit for sowing. This and many other substances have been prepared with a view to being drilled into the ground with or under turnip or other seeds.

MANURES.

Ground, in a state of nature, may be rich and require nothing, or poor and want everything that can be done for it; but there are certain manures that cannot injure by excess, while others may be useless or mischievous. Among the most certain and useful may be reckoned—

VEGETABLE MOULD, OR DECAYED VEGETABLES.—This comprises all the waste of a garden, the leaves swept up by the road-side, and from under all the trees on the estate, or any neighbouring forest. This and other vegetable matter, laid in heaps to rot, may be laid on the ground, or dug in with impunity, for it is simply returning to the earth what has been taken from it, with certain perfectly innocent or useful additions, taken from the atmosphere—for it would be idle to suppose that the plants, from a daisy to an oak, lived entirely on what has been withdrawn from the soil. Vegetable manure, therefore, is decidedly a safe and useful dressing, and it would be difficult to apply too much. Many dig into the ground all the waste of the crop they are taking off. There is but one

objection to this immediate application, the certainty that all manner of insect-eggs must be abundant in the waste leaves, and that many may be thus committed to the soil, to become very shortly enormous plagues. By laying the waste together to rot with or without the aid of lime or other means to hasten decomposition, the great mass of these eggs is destroyed, and the result is a far cleaner and better compost to add to the soil. But there are some estates whereon the leaves and waste form an enormous bulk ; and in such case, the burning of it, and the spreading of the ashes, will be found equally advantageous. Leaves laid up, and allowed to rot into mould, become valuable ; they ought, therefore, to be collected and laid by, year after year. They make fine mould for potting. Cabbage-leaves, and the trimmings and waste of all vegetables, should be thrown in a hole ; and if they become at all offensive, throw some lime over them, and water it. The heap will be rendered perfectly harmless, and that forms a manure that may be used in any quantity, for decaying vegetable returns to the earth just what the earth has given. The next useful and harmless manure is—

NEATS' AND SHEEP-DUNG.—These animals living exclusively on vegetable food, their manure is of the highest importance, and cannot be applied in excess ; for the worst that comes of it may be set down as unnecessary trouble, where such dressing is plentiful. In the application, this may be green or rotted, but the latter is the most easily used. Neats'-dung, collected dry from the forests, commons, and pastures, forms a valuable manure for particular subjects, and should be sought and procured, every opportunity. Sheep-dung forms an excellent liquid manure ; by putting a barrowful into about a hogshead of water, you are enabled to give a good dressing to plants that could not be reached in any other way ; this may be picked up on commons and wastes.

HORSE OR STABLE DUNG is valuable : no manure gives more solid advantage ; that is to say, no manure gives better heart to ground for general purposes, whether ploughed or dug in, as it comes from the stable, or allowed to rot first. The application of manure of this kind may be by digging it in, a spit deep, after spreading it evenly on the surface ; or by forking it in, which will mix it with the top spit more equally. The dung from hot-beds, used for melons, cucumbers, and other early productions, makes excellent manure at

the end of the season ; and those who consider the expense of hot stable-dung, for this purpose, should recollect that the value of it after the heat is gone, and the dung rotted, is as great as it was while hot and in order for the beds.

PIGS-DUNG.—The coarsest and least valuable dung is that of Pigs, which should be well decomposed before using, although it is more often taken from the sty to the ground, and dug in raw. The best mode of applying this strong and offensive dressing is to throw it to a heap, and then spread it out half-a-foot thick, and throw over it a layer of peat-earth, road-sand, or common soil, as thick as it can be afforded,—say three inches. When the sties and pig-yard are again cleaned out, throw another layer of pig-dung, and on that another layer of soil, so repeating this every time, and leaving the heap as long as possible, for the more it is rotted the better. The whole heap then becomes an excellent compost, or dressing, for any ground.

DROPPINGS OF ANIMALS from the road are collected by children in many parts of the country, and may be had cheap. The value of this, as a fertilizer, is unquestionable, and a heap of it is a great acquisition. The cleaner it is preserved the better. It forms excellent top-dressings for many things.

NIGHT-SOIL is a most remarkable manure, although little used until of late years in England, compared with its application in other countries. This should, however, be as carefully used as guano ; for, if applied in too large a quantity, and unmixed, it is dangerous.

Soot is highly valuable. It is not only nutritious, but very destructive to many kinds of vermin. This is generally applied by sowing on the surface, and letting it wash in with the rain. Wood-ashes, also, should be applied in the same way. These two are excellent torments, if not exterminators, of the numerous tribes of bots, or grubs, that so damage a crop, and especially obnoxious to the grub which causes clubbing in the cabbage tribe.

BONES should be collected by all available means, and broken well before use ; nothing does more good to land. They should be bruised with a hammer into small pieces. They may be mixed with any compost, but should be pretty evenly distributed ; because whatever comes in contact with them will show the superiority of growth in a very short

time. Bones crushed or ground to powder are a favourite manure. If the effect is to be immediate, the powder is the better, because it more rapidly amalgamates with the soil; but if permanent, the bruising or using them coarse makes them last much longer. Bones are now such an article of commerce for farming and gardening purposes, that they are ground at mills for the purpose, and shamefully adulterated; but they may be purchased broken or ground to any size, for by means of sieves they are easily separated; and we prefer very much to have them with the fine powder taken out. When, however, they are broken by ourselves, we know there is nothing wrong about them, and the size may be just what we please. We do not like lumps larger than horse-beans; and all that come smaller give instant effect. Very little of this dress goes a great way, and there is nothing pernicious in it. They should either be mixed with something that is to be spread all over, or sown by hand all over the surface, to be forked in a very little way.

CHALK is a good dressing to poor lands, and therefore should, if possible, be provided among other subjects, to be handy in the manure ground. This may be spread over the surface, and be mixed with the soil pretty evenly, but it may lie on the surface for a time. Burning it, to make lime of it, is well worth the trouble, for the benefits are sooner felt, and it is sooner mixed, because it falls into a powder with the mere action of the atmosphere. Lime, in moderate quantity, is of great use in the destruction or discouragement of vermin, especially slugs, snails, and grubs underground.

SOAP-ASH is a very common dressing for land, especially if poor and foul. It is destructive of the grub, and has rarely any bad effect on any soil, though of less use on some than other land. It consists of the refuse of the soap-boilers, and is a strong alkali, used a good deal in some districts. We believe there is hardly any refuse of any kind that might not be made available, if applied moderately and properly. Alkalis generally have the best possible effect in destroying vermin; but they must be moderately used, or they may be too strong for the well-being of vegetable as well as animal life: and Wood-ashes are of great service, spread on the ground and dug in.

GUANO is so much an article of commerce, that all we need say of that part which relates to its real or supposed origin is

that it is the dung of sea-fowl, accumulated during ages, and that it is imported at a cost varying from nine to eleven pounds per ton. It possesses high fertilizing qualities, is applied to the ground many different ways, and is best applied when a shower of rain is not far off, that it may be washed into the land. Of the different methods of applying it, there are two that we recommend before all others for a garden. The first is, to mix it with four or five times its quantity of road-sand, or sifted peat, or other very light soil, and sow it evenly all over the surface. The other is, to dissolve it in water, and water the whole surface. The best way to mix it is to lay four or five inches of the soil level on a stone floor or pavement, and, on this, put about half or three quarters of an inch of Guano, then another layer of soil, like the first, and another three quarters of an inch of Guano, till you have put the quantity you mean to sow; putting four or five inches of soil on the top. Let this lie together till it is wanted. With regard to quantity, two pounds weight to a square rod of ground; that is to say, sixteen feet and a half each way; therefore, sow the quantity of composition that contains two pounds of guano. But we need hardly say that when these layers of guano and soil have lain together a few weeks chop it down in thin slices, and turn it well, to thoroughly mix it all together. Take advantage of showery weather, if you can, that it may not lie and dry on the surface, and in a day or two sow your crops. When you dissolve it in water, you can tell the quantity of water it will take to water all the space and dissolve the quantity of guano required in it; stirring it every day for three days, and water the ground with it. These two are the most' easy methods we know of applying guano. Farmers use the same means, but, instead of sowing the mixture broadcast, they drill it into the ground when they are going to sow. They mix it with other dressings, and do not rely on that alone. They occasionally top dress with it in a mixture of some sorts: but we do not use it ourselves in a garden; we prefer the rotted dung from stable-dung hotbeds, which is half rotted the first year, and is ready for all sorts of use at the end of two. Guano is one of those uncertain things that we should not like to depend on. The quantity put on farming lands, when it is used without other fertilizers, appears to be from two to three hundredweight per acre; but some things

would bear more. Onions, for instance, if the ground be well prepared, and two pounds weight of guano, or two and a half, be watered in a few days before sowing, and once or twice with plain water afterwards, would thrive wonderfully, if the guano be good. Guano ought to be always mixed with twice or thrice its weight of peat-mould, or sand, or other soil.

MARL is a fattish loam, of use in light lands. It is a sort of half-way stuff between ordinary loam and clay, and of great use in improving sandy soils. It would be of little use to speak of the quantity required for a dressing: it would be extremely difficult to give too much; but "every little helps." The benefit of a very light dressing is felt; and liberal dressing repeated would convert a desert into a garden. As in all other soils, there are many qualities, but the sandy soil of many commons, such as Woking, and all the waste lands south of London will be found good.

SALT is useful to kill vermin when they are out of the way of plants. It is used on gravel walks to kill weeds. The danger is in allowing it to reach the verges or edgings, which, unless you are careful, it will. Some dissolve it in water, and distribute it with a water-pot; and it often runs too far. When Salting is resorted to, a dress ought to be drawn the whole length of the walk, on both sides, two or three inches from the edge, because that stops the salt water from reaching the side. Others sow it, and leave the rain to wash it in; but there is more danger in this than in watering, because it gets blown about. Salt is also used on asparagus beds, for that is a marine plant. You may sow as much as will make the beds white, and not risk hurting the plant, while it is known to be a good and profitable dressing.

CHEMICAL MANURES generally are now much used in farming; and some particular experiments with them will form the subject of an Appendix, because they are too varied to be the groundwork of general instructions. The various chemical agents which are now employed in thousands of experiments, by rich farmers, will lead to some general rules for their use.

THE SEWAGE OF LARGE TOWNS will be turned to account. It is worthy of remark, that we have in the United Kingdom sent millions of loads of filth into the various rivers, thus polluting our streams, while we have paid millions for manure of foreign produce, to impoverish us on the one hand, and

only half-dressed the land, and thus lessened our crops, on the other. Our business, however, is not to seek the agency of more than we can obtain among ourselves. The Chinese waste nothing: they submit to offensive smells, to menial employments, to incessant disagreeable occupations, in carrying from house to house the very worst refuse, and apply it to their land. And be it remembered, that there was a time when we paid to have our cesspools emptied, and the contents carried away, without our knowing the value, while those so employed removed it to uninhabited places, to convert it to manure and money. Our advancing civilization and cleanliness, so called, led to what people denominated improvements, and sent the filth down the common sewers, to contaminate the waters we were obliged to drink, and poison the fish in our finest streams. In London, the very Thames, which vied with thousands of rivers in the abundance of fish, and the purity of its waters, has become a reeking, moving mass of filth, hardly surpassed by the very sewers which for miles are emptying their disgusting contents, labelled or numbered all along its banks, and render putrid and foul the whole mass of waters, on which a thousand boats are carrying their living freights daily, to enjoy the convenience, at the expense of breathing a pestilential atmosphere, not many degrees better than those very nuisances which on a much smaller scale are supposed or pretended to be the cause of a mysterious but fatal malady. Such are our present notions of cleanliness, that we gape at a gnat and swallow a camel. We grumble at every little open gutter that gives off its effluvia to comparatively endless space, and pollute a whole river by directing the filth and offal of two millions of people to three or four miles of the only river we can drink from. Connected with this subject, we can only recommend everybody that has a rod of ground to use it, to appropriate the waste of his own house. Contrive all the means at hand to abate the nuisance, but bury it in his own land, that he may reap the benefit of it. Let not a basin of soapsuds, or of dirty water, go for nothing, but remember that it is all convertible to dressing for the ground, and will confer a real benefit on the garden or the field.

LIQUID MANURES are made of all the animal dungs; but those which live exclusively on vegetation are the best for general purposes,—cows and oxen, sheep, rabbits, deer, and horses; and all these are the better when the vegetable that

it contains is decomposed, because then the whole dissolves. A quarter of a peck of either, when rotted into mould, will render ten gallons of water far better than ordinary water for all garden crops; and when applied to onions, makes an astonishing difference, as may be seen in a very short time, by watering one portion with plain water, and the other with such as we have described.

MANURE TANKS.—Everybody should have a tank which would receive all the drainings of manure heaps, and the rains will always occasion a waste of the best juices if this be not done. A tank may be bricked, and in the lowest part of the space occupied by dung-heaps and decaying vegetable matter. These drainings, well diluted, can be used with the greatest possible advantage in dry hot weather; a soaking of the entire ground, not the mere watering of the plants, being the proper mode of applying it. But wherever this is done, it should be, whether little or much, used with as much water as will moisten the whole space to be watered, so that all may fare alike. If there be but little, the ground has the benefit of all there is, and by using enough water all the space is served alike. In all cases where the liquid manure is used, select the crop which is the most in want of it,—that is, the crop on the poorest ground, or that requires the greatest assistance, and give it all without helping any neighbouring subject. If you are so situate as not to be able to use liquid manure to crops, it is just as efficacious to soak a piece of vacant ground with it, because the strength is there ready for the first thing that is placed there; and it is an excellent plan to soak a space of ground the day previous to sowing anything, especially turnips; for, the ground being in good order, the seed vegetates immediately, and having good hold rarely fails to turn out well. There is nothing better in the summer months than a good soaking of the ground previous to planting or sowing; a plain watering is useful, but liquid manure is better, and when you have none it is worth while to make it, by putting a barrowful of horse droppings, cows' dung, or sheep dung, into a hogshead of water the day before it is wanted, and stirring it up two or three times. The application should be all over the surface, not hasty enough to let it run away, but gentle enough to let it soak down three or four inches into the ground. Many things are calculated to form a good dressing, but we may in one word say that

nothing animal or vegetable should be lost, because everything is serviceable to the ground : old rags, paper, woollen cloth, tanners' waste, gas-tar water, ammoniacal liquor from the gas works, the waste lime from the gasworks, all and everything capable of decomposing is a dressing for land. In some of these things there must be a little care, in others it matters little how much is put on ; of vegetable waste, for instance, you cannot have too much. Pigs'-dung and poultry-dung ought to be used carefully ; they are strong, and might be used mischievously, but they should be mixed with as much as their own bulk of some useful soil, and be laid together for a time to rot or amalgamate. In this way the strongest manure may be used.

THE MUCK-HEAP is made up of all sorts of waste, and it is impossible to calculate on the strength of the manure it forms, but one thing may be always done to moderate the strength, so as to prevent mischief. The slops from the house and night-soil are always too strong for use, in any quantity, like other manures ; and the best way to keep them of moderate strength is to mix with something at the time ; road-sand is in general easily obtained, and it would be desirable always to get as much as possible on the premises. Strong slops should always be mixed with as much sand as would absorb it all and lie solid. Soap-suds, vegetable liquor, and ordinary house drainings, might always be thrown into a tub, to be used as common water in watering plants, while strong slops would require ten times the bulk of plain water to render it useful for immediate application to crops ; but those to whom economy is an object must bear in mind that there is not an atom nor a drop of refuse of any kind to be wasted. The better the ground is manured, the better will it yield, and it behoves us to treasure up everything. If we are near to the neighbourhood of lime, it is a treasure, because by a little mixture of lime the most offensive of all is immediately rendered harmless, and this is so important that it should never be lost sight of. Charcoal has the same effect, and is a good fertilizer.

ROAD-SAND AND SCRAPINGS OF DITCHES.—Road-sand, as it is called, being the scrapings of the roads, and which are readily given up in most places, and sold cheap in others, is invaluable in every kind of soil, no matter how light or heavy ; though it is perhaps of the most real service in heavy soils.

The scrapings of banks and ditches, although often foul as regards the seeds of weeds they contain, are rich and valuable, and should lie by themselves, to be applied to such crops as will give opportunity of weeding easily. The richness of this generally compensates for the extra trouble it gives. To this heap may be added all the weedings of your garden, because the heap will always be known as a foul one, and the use of it may be confined to such particular quarters as may be conveniently cropped with strong growing subjects, that will admit of hoeing repeatedly ; for instance, beet-root, potatoes, savoys, brocoli, and cabbage, being properly grown wide enough apart to keep the hoe at work at all good opportunities, the ground may be a little foul without hurting them ; whereas with small crops, such as onions, weeds would be very troublesome. Besides, the crops we have mentioned do well on strong ground, and are not easily discommoded with a few intruders, and weeds are easily removed without disturbing the plants.

APPLICATION OF DRESSING.—In dressing ground generally, you have first to consider the state it is in ; next, the nature of the crop to go on ; lastly, the sorts of dressing you have at command. If you have any light soil, and you could obtain *Marl*, or *rich Loam*, a little of that mixed with your manure would be of the greatest service ; if you can get no marl, dress it with the compost that you have been mixing with lime. The quantity also must be dependent upon your requirements from the land ; you may dress land with the strongest of manure if you are going to sow onions, plant asparagus, or grow beet-root, sea-kale, or pickling cabbages : they are all very hungry, and not very particular. Lay the quantity you intend to put in all over the surface, and let it be turned in nearly a spit deep, or if it be well decomposed, let it be forked in and mixed with the top spit of earth ; but where attention is paid to the general conditions of ground, the dunging or dressing is supplied periodically, without any regard to the particular crop to follow immediately ; and so it is buried to do its part towards fertilizing the soil for the future, while the dressing previously buried is supplying the immediate wants of the crop ; and the difference between putting it a spit deep and mixing it altogether directly is simply called for by the state of the ground : if poor, mix it ; if in good heart, we have only to keep it so, and therefore

bury the dressing. Raw dung is not always good for small crops, and is therefore buried, that the roots may not come in contact with it until the plant is pretty strong; but the mould from decayed vegetable leaves in particular may be laid on in any quantity, and be dug in or mixed up with the soil; it is perfectly innoxious, and will hurt nothing, while it is a first-rate fertilizer.

PEAT EARTH, or BOG EARTH, which is full of dead fibres of roots, and is naturally sandy, is one of the best mediums in which rank strong manures can be mixed to increase the bulk and lower the strength. This, which is the top spit of millions of acres of common, is nevertheless dear wherever it is distant, but to those in the vicinity, who can procure it with little trouble, a great acquisition. Guano is mixed with it in preference to anything, when used on a small scale, but when applied in large quantities, it is mixed with coarser earth, or earth easier procured. If it is to be applied by sowing, sand is better. Peat earth is very light and spongy, excellent for any tender-rooted things, and almost always used for American plants and heaths, and many subjects from the Cape of Good Hope. Peat earth should be laid in a heap by itself, and when used has to be broken to pieces and rubbed through a very coarse sieve; otherwise peat would remain in the very lumps that the spade cut up for almost an indefinite period. The characteristic of regular peat is that it is a mass of half-decomposed fibre, but it seems never to decompose the whole; and this renders it porous and spongy, two points highly essential to the well-being of some plants, and highly beneficial to heavy and adhesive soils. Of course the complete amalgamation cannot be effected on a large scale; but in potted plants, and the soil necessary for them, it can be made available. Indeed it is very largely transported from commons to flower gardens, for the purpose of growing plants that require it; but the nurseries that succeed best with the plants which require such soil are established on the spots where peat soil is natural. The great nurseries at Bagshott and Knap Hill, the most famous in England for American plants, and many others in the vicinity of peat commons, only beat others of less importance because the soil without any dressing or preparation, brings forward the various peat plants in a way that no artificially-made beds of peat can produce them. Now there would be as much trouble to make

such land produce heavy crops of subjects requiring strength of soil, as there is to make any of the many great changes that land requires. The nature of the soil may be appreciated when we say, that if a tree twenty feet high had to be removed from peat soil land, and a lump of half a ton were cut round and cut under so as to release it from the rest, the lifting of the tree would bring all the lump of soil with it, even if it were a solid lump three feet all round it; the small wandering roots of the plant reaching perhaps two-thirds of the way through it, and the mass of fibres holding it together. This quality is not only invaluable for growing such plants, but also for its tenacity in holding together enough to sustain them on their removal, even if they were not replanted for a considerable time, and also to support them occasionally, a season or two when turned out into very unfavourable soil.

TURFS TO FORM COMPOST.—Turfs cut from a pasture not more than two or three inches thick, and laid together to rot a year or two, form the best compost for flowers or vegetables that can be found; and although extravagant to use for common purposes, should always be provided if possible. If they are cut from a waste, or from the road side, or from hungry commons, they should be cut thinner for the sake of keeping up their quality; but the best rule is to cut thick enough to take in all the roots and fibres, which, on good land, perhaps go down three inches, but in bad hungry soil perhaps do not reach two. No opportunity should be lost; whenever they can be had they should be obtained. It is an unequalled dressing for poor land that wants heart. The difference as to the thickness of cutting must be settled by the hold the grass has of the land; gravelly soils suggest a very thin cutting under any circumstances. These have only to be piled in heaps, and allowed to stand till the grass and fibre have rotted into mould.

THE TOP SPIT OF A PASTURE is generally good loam, and ranks next to the turf cut as we have proposed. The larger proportions of loam, if taken deep, lessen the value in this respect only,—there cannot be so much of the turf and fibre rotted in the quantity, and therefore it is so much the worse in point of richness. Always get some of this if you can; it is really useful soil with good heart in it, and will improve any land; for as the thicker the cultivable soil on any place is, the better it is; therefore it may be taken as a general rule,

that whatever can be added that is good in itself is useful even if no better than the rest of the available soil.

DRESSING FOR COTTAGERS.—One of the causes of the superior productions of cottagers is the pains they take to collect all kinds of manures, and waste nothing. Many keep pigs, and in such case all the vegetable waste is thrown to them, there to be partly devoured and converted to dung as far as the waste is eatable, and the remainder gets trampled upon and mixed with the filth, and, when cleared out and laid in a heap, forms an excellent, but very strong compost. This requires putting in the ground a good spit deep. It would be too strong to come in contact with the young fibres of seedling plants; but lying in the ground until the next turning up of the soil, it would give heart to it, and have the best effect; but pig-dung should always be mixed with some kind of soil even while lying in the heap.

DRESSING FOR MARKET GARDENERS.—Market gardeners very frequently dig in the dung just as it is brought down warm from the stables of London, and that in tolerable quantity; not less for the sake of the warmth there is in it, than for the dressing it gives for the next crop; for it is said by them that all the ammonia that would fly off during the whole time it lies above ground is retained in the soil. There is no doubt that each plan has its advantages, and it is unwise to lay down any positive rule when we see, as we may every week of our lives, a dozen market gardeners and gentlemen's gardeners producing first-rate crops, and of the finest qualities, and not two of them acting on the same plan in the dressing of their soil. We have seen the finest strawberry plants that could be grown, with no other dressing than the digging in of all their own waste; but there is no recommending this as a general rule, because, perhaps, there was no occasion for any dressing. Many soils are so strong, and so well adapted for peculiar crops, that they would be fertile without dressing for a long time; but certain it is that self-manuring would go a long way if we really took no more from the earth than was exactly necessary. We have heard of vines abroad which did well for years with nothing but the digging in of their own cuttings; and there never was a more silly habit than sending to market so much unprofitable stuff as we every day see, increasing the bulk to carry, and impoverishing the soil. Look at cabbages the greater part of the season sent to market with

a greater weight of outside leaves than there is in the heart,—the enormous weight which porters have to bear, the additional load the horses have to draw, the rubbish which the retailers or the cooks have to get rid of, and which, while it lies, is a nuisance; and we think it might suggest a much closer trimming than is usually given, and the use of the trimmings on the soil. This, however, is matter for the grower. The more there is of the crop returned to the earth, the less has to be supplied in the way of manure.

WASTE OF FERTILIZING MATERIAL.—Waste is no uncommon thing; large heaps of dung receive all the rain, washing its juices through, and the moisture running down the gutters and ditches as black as treacle, not only from the dung-yards of market and gentlemen's gardens, but even those of large farmers; whereas this liquid, if suffered to drain into a tank, would be invaluable. It would often bear ten times its quantity of plain water, and form an excellent liquid manure, although, if applied in its original state, it would be destructive on account of its extraordinary strength. All composts should, on account of this operation of rain, be placed in heaps, sloping enough to throw off the wet; and manures of all kinds that quickly absorb, and as rapidly give out moisture—in short, everything that has any fertilizing qualities to wash away, should be on a paved space, with drains running to a common tank; and a pump, or some other contrivance, should be placed there to obtain the liquid as it is wanted.

EXPERIMENTS IN DRESSING GROUND.—We are quite aware that chemicals have been found useful, and that the scarcity of ordinary dung has made farmers and gardeners look about them for substitutes; but chemicals should be used with great caution, and never, if we can get that kind of manure which suits all lands, and in particular what we know agrees with that we are cultivating. All experiments should be tried on a small scale, if at all. It is better, in general, to wait while those who have plenty try new fancies, and see the result, before we commit ourselves to any new practice. It may be said, we are loitering on the road to science; but it is better to do that than to go too far, and have to retrace our steps. All we have to do is to follow in the distance—to keep those who are advancing so rapidly within sight, if possible; but by no means to go with them until there is a beaten track, or we have directions that we can depend on. Certain it is that

tens of thousands of pounds have been thrown away on experiments that have only been useful by showing us their failure. Of the multiplicity of manures, chemical and mineral, tried by the gentlemen who would reproach us for not going with them, only a few have led to anything like conclusive results, and a still less number have been really worthy of the importance attached to them. Let any one take up a book on agriculture, written by our forefathers, and how much will they find that has actually passed for new discoveries by more modern writers! The improvements, of which it is fashionable for scientific men to boast, are few and far between. We know that farmers and gardeners who were both careless and extravagant have been plentiful; but there have been many grand exceptions in the same neighbourhoods; and it is hardly fair to denounce farmers and gardeners as a body for the carelessness and extravagance of the few. All we would urge is, that not a particle of animal or vegetable waste be lost sight of. The most offensive can be buried until it is fit for use; and, according to its strength, it may be applied to the land in a lesser or greater quantity. The more it is decomposed, the more instantaneous its effects on the crop; and it may be taken as a general hint, that the soil is the better for the dung or dressing lying in it some time before the crop is sown or planted, whenever it is not thoroughly decomposed before using. When it is well decomposed before it is applied, it may be forked in and mixed with the top spit; and when not so, it is better to dig it in a spit deep. When crops are sown in drills, all decomposed manure may be sown on or with the seeds; and it is now a common practice to do so by way of saving the quantity. We prefer, in all cases, dressing the whole of the soil alike; for, if it does cost more, it will, in the end, turn out more profitable.

MULCHING.—If there be no insects about a garden, no earwigs, there would be a good deal more mulching than there now is; but it harbours the vermin so much, that few gardeners apply it. We have a settled objection to it in hot weather, when people are most anxious to do it. The effect of it is, first, to draw the roots of the plant to the surface, and, unless the mulching is kept moist, the plant flags; that is one of our principal objections: another is, that earwigs seem to form a colony there, and often nearly destroy the plant as well as the flowers. In winter time, it is another affair alto-

gether : mulching keeps off the frost, and is of great service to some fruit-trees, many herbaceous plants, and to vines that are to be forced. Mulching is best done with stable-dung ; and every time a thing is watered, the effect is seen, because it is simply laying dung round the stem on the roots of anything, and every time it is washed by the rains or the water-pot, the dung feeds the plant. It is often done with holly-hocks, when they are coming into bloom, and to dahlias, much to their disadvantage ; for we have seen them half-devoured by the colony they have invited. However, one watering with lime-water will disturb the inhabitants, and perhaps destroy them altogether.

THE LAYING-OUT OF THE GARDEN.

The laying-out of a garden must depend a little upon the use that is to be made of it. A garden of any extent requires three main walks from end to end ; one in the centre, and one on each side within a border-width of the extreme boundary, one across the bottom within border-width of the fence or wall, and one across the upper, and about the same distance from the extreme. Borders on all four sides are handy : we are not supposed to command the situation of the garden, but it is quite certain that such portions of this border as face the south and west will be warm, and those which face the north and east will be cool. If the boundary happens to be somewhere about the points of the compass, one side and one end will be warm, and the other side and end cool ; but this is of small consequence—one-half the border will be each way.

PATHS.—The paths ought not to be less than five feet : if ground is scarce, a barrow can be pushed along a walk of three feet, but there is nothing like room. If we have paths too narrow, two barrows could not pass, and there would be fifty inconveniences that we hardly contemplate, and could not foresee, perhaps. These paths are not to be mere spaces marked out, and trodden down hard ; although many gardens have no other, and in such case they are useless in wet weather. No ; they should be the first space that is dug all over a piece of ground to be converted to garden purposes. Mark them out with a line, and dig out a good spade deep all along, the width you intend the path to be, sloping your spade outwards, while you cut the two sides, to form a bank as even

as a board. If you are likely to want the mould, wheel all of it to a heap at the most convenient part of the premises. If the garden happens to be a great length, say a hundred yards or near it, it would be as well to have a cross-walk or path also, about half-way down, instead of having to go the whole round when you are at work on the middle; but this is a mere question of convenience. When you come to trench and dig the whole space, throw all sorts of stones and rubbish, brickbats, tiles, oyster-shells, broken glass and crockery, brick rubbish, and everything else that is hard and durable into these paths; and when you have thrown all that you meet with in digging and trenching, procure enough of any kind of rough stuff to fill them nearly up with, so that there may be, say, three inches left for road-sand or gravel, to make a facing good and dry to walk on, or wheel a barrow on.

COMPARTMENTS AND THEIR MANAGEMENT.—You may now, with stakes of wood driven down here and there, mark your ground out into compartments, that you may number as you please, say from one up to twenty or more; this facilitates a system which every gardener, professional or amateur, ought to adopt—that is, make memorandums of his garden operations, taking especial account of the times he sows and gathers, what department it is in, how he manured or dressed (if at all), and the general state, if not actual quantities of the crop; and, if he sells, what they brought him. By this he may always avoid sowing or planting the same thing twice on the same spot, until he has sown the whole ground in turn. For instance, say he plants No. 1 with potatoes in November 1849, he need not plant No. 1 with potatoes again until all the other departments have been planted with them; or, perhaps, he may plant No. 1 with potatoes in November, No. 6 with the same vegetable in December, and No. 10 and No. 12 in February. Here are four compartments engaged in potatoes the same season. He can avoid planting these four with potatoes for four or five years again, only by looking at his book. It is the same with all the rest of the crops: carrots, beetroot, parsnips, turnips, or cabbages of all kinds, may be regulated in the same way; for crops ought to be varied as much as possible, and the ground should be dunged or otherwise at every cropping, according to the plants that have come off, as well as those that go on. When the garden is so marked out, the alleys should be made at the marks; and the

best way is never to disturb the earth for eighteen inches' width from mark to mark, but let the hard undisturbed ground form a sort of path, to divide all these compartments; by leaving them hard and undug, they will always keep drier than if they were disturbed at the digging time; besides which, they would be useful to wheel on, as the barrow-wheel would not sink in it. When the ground is all dug, and the alleys are merely unplanted spaces, the place is never so tidy. Whenever the ground is dug, the line has to be stretched along the edge of those paths, and the soil dug sloping inwards, so that the path is not broken at the edges; and great care should be taken not to encroach upon the width of the paths, nor to make them rotten by omitting to chop or cut the side down low enough to prevent the lifting of the soil in the digging, from cracking or disturbing it. Paths formed of the ground itself are never too good; and if they are disturbed at all, they are often impassable, or, at least, unpleasant. The digging of these compartments, or the trenching of them, as the case may be, is to be regulated by what they are required to produce; and the dressing of them may safely be done before they are dug, that the manure or compost may be buried. If the first crop does not get much the better for it, the second will. It may be, that the ground is not square, and does not approximate to a square; when this is the case, it is better to have the paths straight notwithstanding: they need not be parallel. The middle and two side walks will do very well for long square pieces of ground, but odd-shaped ground requires a different disposition of the main walks. There should, however, be one decided rule—that of having a main path all round the ground about a reasonable distance for a good border, something between six and ten feet; and it is convenient that the walk or path next this border should be four or five feet wide, and perfectly straight from angle to angle, however many angles there may be; and the compartments of the garden should be well-defined in straight lines or angles, for the convenience of regulating the lines of the crop. If you feel that ground is a great object, you may do away with the paths or alleys that are to permanently divide the compartments, and merely keep marks, from which at all times you can stretch a line, to show the extent of the compartments, and only leave the crops themselves to settle or show the boundaries of such compartments. A notice of

examples of odd-shaped gardens may be useful to give hints to those who are laying out grounds for plain gardens at present. The principal feature is, that the outer walk is within as near as may be the width of a border from the extreme boundary; and that, consistent with this, the path is in angles to meet the inequalities of the boundary, the border being here and there narrower or wider, as the straight line of the path happens to differ from the boundary line.

GENERAL GARDENING DIFFERENT FROM LANDSCAPE.

Straight walks, as far as they are practicable, are the most convenient in general gardening, which is every way different from landscape gardening. The one is a market garden or nursery for plants, and right lines are the most profitable; the other, a dress garden, or an imitation of nature in her best features, and must exhibit no trace of art except in perfecting such features as are natural. The lawn may be kept up as smooth as velvet, or imitation of some pastures; the clumps may be like those of the forest, which are more beautiful than the rest; the artificial river, or brook, or lake, may imitate the finest spot in nature, but the artist's entire aim must be to conceal art in the production of natural features. He may imitate nature's softest scenes, or her most rugged beauties, but he must not expose the artist's work. Consistency must characterise every inch of the space he covers or appropriates; every tree or shrub he plants must be in nature's strict rules of propriety—not only so, he must only follow nature as far as she is correct. He must not run after *lusus natureæ*. An artist would be as mad to paint a picture with one of those extraordinary and unnatural-looking skies of mottled, streaked, and fantastically-marked clouds of gold and green and silver, as a gardener who would put bulrushes and water-lilies on a hill, or firs in a swamp. There have been such things seen in nature, but they are the mere sports of nature. But in artificial, or, as we might call it, manufacturing gardening,—that is, gardening for production only instead of for ornament,—not an inch should be lost for the sake of appearance. The crops are in rows as straight as the line can mark them, for the sake of giving the exact room required, and no more; and the paths should be the same. Even the boundary, which we

cannot control, must be rendered subservient to straight rows, as far as we can place them, and the inequalities alone mark where the planting is to stop.

KITCHEN GARDENING.—The advantage of marking the compartments is, that they may be dressed in different ways: one may be dressed with one compost, another with a different one; and the record of how they are dressed will enable us to tell how each has answered its purpose for the several crops. But we might go further than this; we might change the entire nature of the soil in one compartment for any particular purpose, by removing some of its own soil and substituting other. We might attempt to point out or indicate where the compartments might be divided; but this may be always a matter of fancy. They ought not to be too large, in proportion to the space occupied by the whole; nor ought they to be too numerous. They should approximate a little to the nature of the crops intended to be produced. If a great variety be required, the compartments may be numerous. If, on the contrary, the crops are to be confined to a few, the compartments need not be so small, nor so many in number. But enough ought to be done in this way for the purpose of recording what each compartment is done with—the sowing or cropping of them, the removal and character of the crop, the following dressings, and successive operations, and results, costs, produce, and such other particulars as may be worth notice. The garden, so far as we have gone, may be said to be drained, trenched, laid-out, the paths made, and divided into compartments.

SOWING.—The various modes of cropping the ground are, sowing broadcast, which is spreading the seeds over the whole surface thick enough to cover the ground properly, but not so thick as to waste it; sowing in drills, which is done by hand with a hoe, or by machines, which make the drills, and drop the seeds in the drills they make; and sowing by dibble, which is making holes the depth the seed ought to be buried, and dropping the seeds in the holes so made. There are many advocates for all three modes, but for some particular crops one may be preferred to the other occasionally. There are, however, machines now for sowing broadcast, and also in drills of any depth or distance; though broadcast was doubtless so called from the fact that men threw the seed abroad from a basket before them, and, strewing it right and left, made a

fair distribution over the whole surface to be sown. When seed is sown broadcast, it is generally raked or harrowed into the ground, and afterwards rolled ; when sown in drills, they may be made by hand, and the seed may be covered in by hand with a hoe, or the machine which makes drills, and deposits the seeds, is contrived so as to cover it over at the same time. Dibbling in seeds is frequently resorted to in gardens ; and of late years, even the sowing or dibbling in of wheat upon a large scale has been advocated with some energy by those who affect to have succeeded. Machines have been constructed so as to make small holes in the ground, and leave their seeds in the holes, so that, with comparatively little trouble or labour, a large extent of land can be sown with an immense saving of seed, and a uniformity that could never be secured by hand.

DRILLING.—The efficacy of these several modes of getting seed into the ground is much the same ; there are some general rules to attend to, and there ends all that concerns the germination, so far as the sowing goes. In all garden matters, the sowing by hand is generally resorted to, and it is simply a question, often settled by what a man has been used to, whether he will sow broadcast or in drills, turnips, carrots, parsnips, beetroot, parsley, spinach, and various other crops, that require to be left at certain distances apart to complete their growth. When sown in drills, we require to have the drills at just the distance apart that the plants are to be left, because then we have only to thin the plants in the row to the same distance as the drills are apart, and we have the work done. Young gardeners are recommended to adopt the drill system, because it is such a capital guide to them in the thinning out of the crops ; but experienced gardeners sow broadcast, because it is the quickest operation, and they can chop out the plants to the proper distances from habit. We recommend drill culture for young gardeners, because, although it takes longer time to sow, it takes much less time to thin out, and the straight lines are such a guide to the unpractised hand. Beans and peas are cultivated in rows, consequently are always sown in drills, and there are other subjects which are for the most part dibbled in. Potatoes, for instance, are dibbled in, one man going along the rows making holes of a right depth, into which his follower drops the sets as he advances ; but we prefer even potatoes planted in drills of a

proper depth ; and on a large scale it is very generally adopted. Even the plough is set to work to make a furrow, into which the seed is dropped at proper distances, and the next furrow made fills up the one which has received the seed.

The depth which seeds ought to be placed in the earth depends greatly on the size of them ; small seeds ought only to be fairly covered, but covering is absolutely necessary for protection, or it would be devoured by birds and also vermin, even were it not necessary for its proper germination. However, so long as all small seeds are fairly covered, they will take no harm ; the potato requires to be covered four inches at the least in summer time, and six if planted in winter or autumn ; scarlet beans should be covered a good inch and a half, and French beans half that depth.

The great art of sowing is, to be able to spread the seed so thinly and evenly as to waste very little : even the advocate of broadcast sowing concedes this, that where there is one that can sow well, there are hundreds who waste seed, and yet do not sow all the ground. Many seeds are sown on beds very thick, for the sake of taking but little room at first, and when they are grown large enough to handle, pricked out three or four inches apart to grow strong, and lastly planted out at the proper distances to make their full growth ; such, for instance, as cabbages of all kinds, Brussels sprouts, brocoli, cauliflowers, Scotch kale, and even scarlet beans, are often, for the sake of forwarding them, grown in a patch under slight protection, and planted out in May.

The seasons of sowing have a good deal to do with the mode of sowing ; and the length of time a crop has to be in the ground is another circumstance which weighs a little in the determining as to the mode of sowing ; but, upon the whole, in garden-crops, for the sake of appearance, we should always recommend drill-sowing, in preference to broadcast.

There are some permanent subjects which may be either sown where they are to remain, or sown in patches, and be planted out. Of the most particular, there are asparagus, rhubarb, and sea-kale. Many make asparagus-beds with roots one or two years old, and sea-kale with plants which have grown one complete season and died down. Rhubarb is frequently formed into regular plantations from roots, offsets, and seeds, as the case may be. In these cases, when the seed is to form the bed, rhubarb would be dibbled in at the proper

distances, the precaution against failure being the dropping of two seeds in instead of one, and when up removing the weakest. Sea-kale may be also dibbled in, two or three seeds in a hole, for the mere opportunity of removing the least likely plant to succeed. Asparagus, in the same way, may be dibbled in; but there is the objection, which applies to all three alike, the ground is occupied unnecessarily for a considerable time, whereas, if these seeds are sown thickly in a smaller space of ground, and planted at proper distances when they are strong enough, there is no ground lost. We are not inclined to admit that which the advocates for sowing on the permanent beds claim; they say that the plants are stronger and better for never being removed: stronger they may be, better they cannot; the check the plants or roots receive is of the greatest service; it keeps them from growing so rank, and sweetens their flavour, and generally improves their habit.

The whole routine of sowing and cropping a new kitchen garden may be learned from the Calendars, but a few words may be useful here. There is a double argument upon the subject of seasons, but the side to be taken will depend on a person's object and wants. One man may be anxious to have things as early and as late as possible; and he may consider that losing half-a-dozen sowings by means of bad weather is of no consequence as compared with the chance of a dish of peas a fortnight earlier or later than the regular seasons; such a person may begin sowing peas in November, and continue every three weeks all through the winter, spring, and summer. Another may care nothing about things out of season, and therefore depend entirely upon main crops, which he will sow at the particular season most likely to yield him the best return. Here are two managements, then, entirely different, one quite as proper as the other for their respective advocates, but all persons of humble means should study main crops, and run no risk; that is to say, none but the risk attendant on all cultivation, after we have done our best as to the season. Again, one may sow radishes in the autumn, with a foreknowledge that he must obtain litter, and cover up nightly, until May; while another would not give a farthing to have radishes before he can get them from the open ground without care or trouble, and consequently will not sow a seed until the ordinary time for unprotected crops. These very opposite motives give rise to two very different systems of

cultivation, both equally proper in their way, but the one comprising all the arts required to bring things before their time, the other trusting to the proper season only, and husbanding both time and money: the former adapted to the enthusiastic gardener, who aims to beat the seasons, and often succeeds; the other is the wiser course for the cottage gardener, who works for profitable crops, and will risk nothing for the speculative gratification of either ambition or appetite. But the plan of operations is the same both ways; the difference is, that one sows half-a-dozen crops of peas, radishes, and other vegetables, before the other sows at all. Let us, then, look at the general directions for the proper season, and the only difference will be, that one must use a hand-glass, a frame, litter, hoops and mats, or some other protection, while the other lets everything take its chance.

CROPPING.—Every one of the cabbage tribe—savoy, picklers, Brussels sprouts, Scotch kale, cauliflowers, and brocoli, of all the kinds—should be sown on a seed-bed. Let the beds for this purpose be four feet wide, with eighteen-inch alleys between; let them be well dug and dressed, and the earth well pulverized. Divide these beds into as many compartments as you intend to sow varieties; and, laying down a couple of old sacks, so as to leave only the part to be sown exposed, sow the sorts of seed thinly, but evenly, to fill up the allotted space, either raking it in, or sifting enough fine soil over it to cover the seed; by removing one sack close up to the other, you will cover the sown part as far as you have gone, and then remove the other sack from the place unsown to the distance you want to occupy with the next sort of seed. In this way you may fill up your beds, and yet keep each sort of seed very distinct. When this sowing is done, you may occupy other spaces in the garden with carrots, spinach, onions, leeks, and other vegetables that have not to be moved; and at a later season the beet and parsnips; beans and peas may be sown any time, French beans rather late, scarlet beans last; also radishes and small salad, herbs, lettuces, and other subjects likely to be wanted. But we have more to do with the practical part of the work than we have with the seasons, which we have shown may be adapted to please others.

PRICKING OUT.—When all the cabbage tribe, brocoli, kale, and other things for planting out, have come up, and are

getting four rough leaves, they must be carefully hand-weeded ; and you must prepare other four-foot-wide beds, well dressed, into which all the young seedlings are to be pricked—that is, they are to be put in the new beds, four to six inches apart, by taking them carefully from the seed-bed, without breaking their fibres, and by making a hole large enough to take in their roots ; the plants are to be held with the left hand at the height they are to be kept, and with the dibble put the earth to the roots. The whole of the plants from the seed-bed may be thus disposed of, recollecting that each sort is to be kept separate, the same as they were in the seed-bed, and that they will require ten times the room in the store-bed that they had in the seed-bed. Many plants left in the seed-beds will be too small ; but if they are thinned out enough, they will grow stronger there, as well as in the store-bed ; for where they are pricked out a few inches apart, to grow larger, is in fact the store-bed, from which they will be taken at the proper season for planting out. During the first few weeks they will require hand-weeding, for in their young state a few rank weeds would fairly destroy them altogether ; after they have had a month or six weeks' growth, they will in turn be too strong to let the weeds grow.

THINNING THE CROPS.—While, however, these crops are getting ready for pricking out, the spinach and onions, carrots and other matters have been growing fast, and will require hoeing out and thinning ; for if they were left as thick as they were sown, there would be no crop at all ; the plants would destroy each other. If they have been sown in drills, at proper distances, you have only to hoe away the plants in the row till they are the same distance from each other one way as they are the other ; and the distance, being already so well defined between the rows, assists a young hand very much in the regulation of his crop. In market-gardens and tolerably large establishments, and indeed most places where there are regular gardeners, the broadcast is preferred, as the experienced hand will rather see a little irregularity than hoe up strong plants ; so that you will always observe irregularities in a broad piece. With onions, it is almost universal to sow broadcast ; and there are not many who allow more than four inches between the plants, so that in heavy crops, on good land, they touch each other in many places, and are very close in all. The great art in sowing is, to distribute the seed

equally all over a given space ; that is, whether the seed is to be an inch apart or three inches apart, to have no more on one spot than on another ; but there are many things that operate against this. In the first place, some seed is so full of dead, that scarcely one in twenty-five seeds will come up ; in other cases, fifty per cent. may germinate ; and we once gave a man some onion-seed of our own saving, and when he sowed it he was puzzled at the result ; he had not sown it thicker than usual with his former seed, but here they actually choked one another. He had been used to have seed sent down from London, which never came up too thick, and probably not a fourth was alive ; but here every seed told, and it was as thick as small salading. Falling later into the season, we have beet-root, a very principal crop, to look after, and it may be sown in drills, six or eight inches apart, and be dropped in, a seed or two every six or eight inches in the row ; or it may be dibbled in at those distances ; or it may be sown as thinly as possible broadcast, to be hoed as turnips are, clearing away all but plants enough to stand eight inches apart all over the bed. The clearing them of weeds at the same time as they are thinned out, and keeping them so, are matters of course ; and crops of all sorts want the same attention.

TRANSPLANTING.—By the time beans and peas are earthed up, and the former staked, to keep them off the ground, the plants which were pricked out in the store-beds are getting large, and vacant ground may be filled with them ; the cabbages may be the first that are put out in rows, a foot apart, and the rows eighteen inches from each other. Larger sorts of cabbage may be still more distant ; but this is far enough for all the moderate-sized ones, because as soon as they have grown enough to be worth pulling, every other plant may be removed, and then the distances of the plants will be eighteen inches by two feet. The savoys, Brussels sprouts, pickling cabbages, brocoli, kale, and other winter crops, may wait somewhat later ; and when planted out, advantage must be taken of heavy showers, so as to plant them out when the ground is moist. The planting out of these winter greens may be done at many different times ; generally speaking, they wait for the ground, and many fill it up as fast as other crops are got rid of.

All the various kinds of crops so planted out must be

earthed up; that is to say, the hoe must be set to work between the rows, and the loose earth drawn up to the stems of the plants, forming a little bank next to their stalks, the whole length of the row, and this should always be done in a dry day. Peas and beans are also the better for this; and we may consider that, this fairly done, the spinach, turnips, carrots, onions thinned out, the beet-root well up, the stock-beds not empty, and all things clean, the garden may be properly called cropped; not that we are to overlook that, once regular in her productions, the garden will be as regular in her failures, and the decline of a crop is as certain as its arrival at perfection. Sowing, pricking out, and transplanting, constitutes the cropping of a kitchen-garden; but there are certain things which, as we have hinted before, may be sown again and again. Thus spinach, turnips, carrots, beans, peas, potatoes, cabbages, lettuces, and salads generally, may be sown a score times in a summer; and successive crops of many things are desirable; but the work is the same; the sowing, pricking out, transplanting, which last is the same as pricking out, only on a larger scale, are precisely the same for one season as another. The distances of all the tribe, cabbage, cauliflower, brocoli, and savoy, two feet by eighteen inches will always answer the purpose; and there is no more difficulty in doing this six times a summer than once. The winter greens are, in fact, generally subservient to other crops; till they are gone off, the others cannot go in; and when everything else suits, the weather is dry and parching, and therefore they must wait for wet.

But the mere vegetable portion of a garden is but little towards the general stock. It has to be planted with the usual bushes and trees, if it be a kitchen-garden; with shrubs and plants if it be a pleasure-garden; and with flowers, if it be intended for such a department at all. Yet we are not to forget that flowers, and especially the whole race of perennials, require precisely the same management as a common cabbage. The sowing is the same; the pricking out into store-beds, the same; the planting ultimately in the places where they are to bloom and perfect themselves, all come to the same end, as well as begin at the same beginning. The mere difference of the size or growth of the plants is nothing. The sweet-pea in the flower-garden wants the same attention as the eatable pea of the kitchen-garden. The only difference between the flower

and kitchen gardens is, the great extent of varieties in the one as compared with the other; but the great variety of flowers does not require a great variety of treatment; what is good for the wallflower and sweetwilliam, both perennial flowers, is also good for the polyanthus, the pink, the stock, columbine, carnation, and all other hardy or moderately hardy plants. The sowing is the same, the pricking out the same, the transplanting the same; and, in fact, all other operations, until we come to the growing any of them in pots, of which we intend to speak in another place. There are, however, delicate plants which require different treatment; for the tomato, chili, and capsicum of the kitchen-garden are as tender as the balsam, coxcomb, and egg-plant of the flower-garden; and up to a certain point, that is to say, until the warm weather of June, they may not be trusted out.

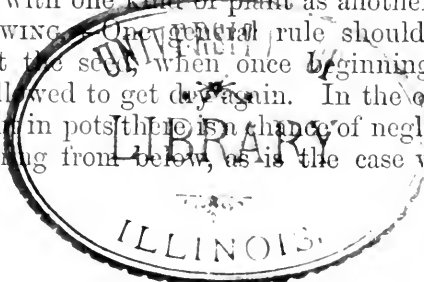
FLOWER AND KITCHEN GARDENING COMPARED.—The sowing of delicate seeds requires great care, and, generally speaking, even if the plant be hardy, valuable seeds are sown in pans, pots, or boxes; not for the sake of being protected, so much as for the sake of preventing waste. The principle, however, of sowing is the same: the seed has to be sown and covered, which covering is always best done with a small sieve and some fine compost. Some flower-seeds are exceedingly delicate, but scarcely any can be more so than celery, nor are there many that come up weaker. These undergo fully as tender a treatment as flowers; they are pricked out, two or three inches apart, while the plants are very young. They are even begun for the earliest season by sowing the seeds in a pot, and placing it in heat. When they are pricked out, it is generally under a frame, and it is not until they are tolerably strong that they are ever put into their final place of abode. The only difference with flowers is this, their final destination: a hundred or two cauliflowers, or celery, or brocoli, are placed in a formal manner, as a crop; and a hundred or two flowers get pushed about into every part of the borders and beds, and are mixed with a hundred other kinds of plants.

SOWING FLOWER-SEEDS.—The sowing of flower-seeds in borders is common enough, although it is far better to sow in pots, and turn them out into borders. Flower-seeds are sown in patches, and when they come up, the number of plants to be left is often not so much as a tenth of the number that

have come up. Generally speaking, those sown in the borders are stronger and more rampant than those sown in pots and turned out ; but they are not the better for their strength ; the check plants meet with in the pot, and when turned out, moderates the growth and hastens the bloom ; and, as a general rule, this holds good with other things. Brocoli left in the seed-bed, and with plenty of room and good soil, will not make so good a head as that which has been moved twice ; there will be more green, perhaps, but less flower. Peas sown in boxes, and then put out in rows, come to flower in a more dwarf state, and have a good deal more flower, in proportion to their size, than those sown where they are to grow. Scarlet beans, partly starved in a pot, and then planted out, will have mostly more flowers and pods than those sown in the row at once, though they will not have so much rampant growth.

SOWING TREE-SEEDS.—The sowing of seeds extends, however, from small salading to the sturdy oak ; and as much, perhaps, has been written upon one subject as we are taking for the whole. In the sowing of haws and hips for thorns and briars, acorns for the oak, pips for apples and pears, stones for plums and cherries, and all things down to the little seeds of strawberries and raspberries, to produce those plants and canes, all require only to be placed in the earth, to be covered enough to conceal them from the vermin, and shield them from the heating rays of the sun, and time will do the rest. They must all be kept clear of weeds, for these drain the earth of its moisture, where moisture is most wanted, that is, near the surface. The whole management of any or all these consists in keeping them clean and giving them water when they would be parched and perhaps killed without it. When they have had a year's growth,—and it is to be noticed that some of them will be a year coming up, or a great portion of it,—they will remove at the proper time, and are bedded out, that is, placed in the easiest way a few inches apart, and then provided with good nourishment and better room ; but the sowing part is as simple with one kind of plant as another.

TREATMENT AFTER SOWING.—One general rule should be observed, which is, that the seeds, when once beginning to swell, should never be allowed to get dry again. In the open ground it seldom does, but in pots there is a chance of neglect ; the seeds can draw nothing from below, as is the case with



those in the open air, and therefore require constant watching; nor must young seedlings be allowed to want water at any time, because they soon feel it and flag, and if they flag too long they do not recover. It is, too, with the exception of slight annuals, almost invariably the case, that as soon as we can handle them, they derive advantage from removing from the seedling-pot or bed, and being pricked out into fresh soil, which of course must be appropriate, even if only an inch apart, but the distance must depend on the probable growth.

CHOICE OF SEED.—As the sooner the seed is sown after it is ripe, the more certain it is of germinating, most people choose the seed of the previous season; but there are many kinds of seeds that will last some years, and be good, and there are others that are considered all the better if some of their powers are reduced by keeping. The cucumber and melon are considered the better for keeping; that is, they do not grow so vigorously, but they bear sooner and better. All the seeds which are imported should be sown immediately, because we do not know how old they may be. Stove and greenhouse plants, at least many of them, seed freely in the keeping of a good gardener; and these should be sown as soon as they are ripe, because they are more certain of coming up, and, being in a climate that suits them, it matters but little when they appear. They can be grown as well through the winter, with proper care, as they would in summer. Those who prefer the spring often find it more difficult to rear the young plants through a hot summer, than they ever find it to bring them through the winter, because they have no business to suffer from cold, and it is bad management if they suffer from damp. But if seeds arrive from abroad, at the very worst period for sowing, they should nevertheless be sown, because many are on arrival at the last stage of vitality, and a very short time would deprive us of the chance of their germinating at all.

PLANTING.

There has been no little pains taken to teach the rising generation how to plant, if we judge by the number and extent of the works on the subject; but their number and extent have alone perhaps deterred many from attempting to learn by those means. We propose to reduce planting to a very simple operation, governed by the most unerring prin-

principles, and we do not allow ourselves to find any difficulty in an operation so simple. There is nothing more common than to see in anything like a new plantation of various trees and shrubs, many that have suffered considerably, some that are almost dead, and others that have altogether failed. This is the result of downright bad management. There is nothing in the age of the trees or in the nature of them to render such a result likely, and it can only have happened by removing them when all their roots were active and the other organs correspondingly at work, or by a careless sacrifice of parts of their roots in taking up; or by the ground being in bad order when they were planted, or by improper planting.

PROPER SEASON FOR PLANTING.—The essentials in planting are—to choose the period when all the organs of the plant are dormant; that is, after the season's growth is completed, and the foliage has attained its size, and before there is any movement towards the new growth. Deciduous trees speak for themselves; when their leaves have fallen, they are at rest, and the moving ought to take place before the new buds have begun to swell; not that there is much mischief in a little delay, but the proper time is before there is any swelling of the buds;—next, to take up the tree with every fibre undamaged; and more pains is required to accomplish this than many people think proper to take; thirdly, whatever damage the root sustains must be compensated for by a corresponding reduction of the tree;—fourthly, the planting must be conducted so that no violence is done to the parts in the ground; the earth must be made to fill up the interstices between the roots; there must be no hollow places. When a tree has suffered much, it is worth the trouble of making the hole full of mud; that is, pour two or three pails of water into the hole, and throw in a cone of loose earth on which the root may be placed, and fill up with loose earth all round by moving the tree sideways, backward and forward, and lifting it a little, and continuing to fill it with the earth as fast as the water will allow. The tree may be made a fixture in the middle of this soft and tractable soil at a proper height, and a little patience will enable us to hold it moderately firm, and put stakes to hold it while everything subsides. We do not recommend this to trees removed as they ought to be; we prefer dry planting when the soil is in good order, and if the earth is bruised fine, we can always get it in among the roots

well enough to stand without suffering. Our first business, then, is to take the plants up well. Dig round them in a circle as far from the stem as where the ends of the fibres reach ; release them as well as they can be released without breaking,—at any rate break them as little as possible ; then with a sharp knife cut off every bruised end and every ragged place where, in spite of the care in taking up, there may have been pieces broken or chopped off ; and, having estimated in your own mind the quantity of root lost, make ample amends by reducing the head. Cut out all weak shoots close to the stem ; cut out any that grow upwards or crosswise in the centre ; keep only the best branches that grow in the best direction, and if any of them are too long, shorten them also. Then dig your hole deep enough to take in all the root, and if there be any tap root,—that is, root growing downwards,—sacrifice it at once by cutting it close up to the bottom of the main stem. Having made the hole large enough and deep enough to take in the root, fill in some soft well-worked soil to press the roots into without bruising ; then, holding the tree upright while the hole is filled in, move the head of the tree downwards one side and then the other, and backwards and forwards, to work the soil in between the roots, and if it be any too deep, lift it up until it is pretty nearly as you want it, when they may fill up the rest of the hole, and you may tread it in well, not by pressing the soil close to the stem, but by treading on it all round where the points of the roots are, and when you have it pretty firm, drive three sloping stakes to meet at the stem, and fasten it with straw bands, so that the wind cannot rock it or disturb it. In this way, whether it is an oak or a walnut-tree, a gooseberry-bush or a laurel, you may always secure the well-being of any plant with ordinary care.

But though the deciduous trees show us so well when in their proper season of rest, it is not so palpable at first sight with evergreens. It wants nice observation to know their season of rest. In some it is midsummer, in others later ; but the cause of so many failures in evergreens is the removing of them when they are active, and have not completed their work. If the foliage has attained its full size and its proper colour—if the last growth has assumed the same colour as the rest of the tree, you may pretty safely remove it. But we have seen firs moved and planted when the new push of

growth was commenced, and we have seen them die. We have seen them removed after they had made their growth, but it had not ripened, and the shoots had not assumed their permanent position, and the natural consequence followed—they were perhaps two seasons dying, but they commenced their decay from the moment their roots were taken from the ground. If the ground, when trees are planted, is too dry, water must be administered, and in no small quantity, because, when we have done our best in taking up a plant, there has always been some sacrifice. There is an exception, perhaps, in plants taken out of peat; for it has been often seen that a piece of the earth larger than the entire root is chopped out whole, and these plants cannot even feel their removal; they do not lose a fibre, and so completely are they taken up by good nurserymen, that if they are in bloom they do not even fade. Planting, after all, then, consists—first, in removing a plant from the place in which it grows without disturbing so as to lose any of its roots, and that, too, at the period when its roots are of least use to it; secondly, in counteracting the mischief, if we have lost any roots, by lessening the work the root has to do—that is, by cutting away a sufficient portion of the tree to make up for the loss of roots; thirdly, in placing it again in the ground, where it is wanted, as solidly, and with the roots as near as we can place them in the position they were in their old situation; fourthly, in supplying moisture, if it be deficient, and so fostering it in its place that it shall not afterwards be disturbed. So much for planting trees and shrubs.

In planting largely, as in timbering estates, the trees are generally used so small that little pains are taken to keep the roots whole, (except with the coniferæ, which will not bear pruning,) oaks, elms, beech, alder, ash, plane, and in fact all deciduous trees, being taken up and root-pruned, as well as head-pruned, with the greatest advantage; and if the soil be at all congenial to the work, they are very carelessly planted. A man will drive his spade, which is a strong one, sloping into the soil, and lift it a little, not by pressing down the handle, but by raising it up; the young tree is tucked into the vacancy, and the sloping clod pressed back upon it, and there ends the operation; but it is far the best way to get plants a year or two old, dig the ground properly, and to plant it solidly and well; for if this be well managed, the tree is

none the worse for its moving, and if it be good soil it soon makes a goodly show. Much of course depends on the extent of planting; but, in a general way, half the quantity done well is more profitable than a great extent managed slovenly. It is the planting that settles the fate of a tree in a great measure; for if the trees be taken up well, judiciously pruned, and well planted, it well repays the owner for all the extra cost.

The planting in gardens consists chiefly of fruit and ornamental trees, and shrubs. One of the most important points to look to is often neglected—the placing of the plant at a proper depth. Plant some trees too deep, and it is of little consequence, because they will strike new roots near the surface; but serve others so, and especially the coniferæ, and they will begin to get less healthy the first season, and gradually dwindle, until they go right off. Gooseberry and currant trees planted too deep will take no immediate harm, but the chances are that they yield annually a plentiful crop of suckers, and continue troublesome as long as they live.

PLANTING IN BAD SOIL.—There are many stratagems used, when the soil is bad, to prevent the roots of trees from going down to it; some make a flooring of brick rubbish, others actually put a pavement under the roots; but the best way is to give each tree a fair supply of good soil, by removing the bad to make way for it, and filling it up with the top spit; then to plant high enough, and, before the tree is put in the ground, cut every bit of the root that shoots downwards close off; when this is done, the tree will do well for years, because roots do not seek an uncongenial soil while there is any they like to get hold of; it is only when they have exhausted the good within reach that they feel the effects of the bad, and the pavement is as bad as anything. Deep planting ought always to be avoided—it never can be good; and it is only those trees which will strike root all the way up the trunk, if there be soil to strike, that can prosper under the circumstances. The mulberry is one of these; many have raised mounds half way up the trunk, and the tree has been none the worse; but others are damaged greatly by being put even a little below the collar. We remember a rose nurseryman who planted a clump of standards, half standards, and dwarf standards, to give a fine rounding effect to the mass of bloom,

and the first season it was very beautiful, but towards the close of the season, some looked very poorly and others went dead, the stock itself having died before the head. The man was paid for his clump ; and though he was to do great things the next year, he did not make his appearance ; eight or ten having become blemishes, they were taken up, and, to our astonishment, they had been sunk to keep their heads uniform, some six inches, some a foot, and one nearly eighteen inches. This led to a general trial of all the sickly ones, and they had been sunk in the same way, but not so deep. From this time we never trusted anybody that we bought of to plant roses. We ought, however, to state, that the rose nurseryman was not an English nurseryman, and that we never heard of this trick being tried before or since ; but we can imagine that there may have been others who, to make a pair match better, may have put one deeper without dreaming of the consequences ; and we know, from long experience, that many trees are much the worse for it, although they have not actually died under the infliction.

DRAINING IN GENERAL,

AND THE MODES OF EXECUTING IT.

Although we have touched on this subject in the early occupation of a garden and laying it out, it is so essential to the well-being of everything, and the want of it has defeated so many excellent florists and amateurs in their attempts to cultivate florists' flowers and plants, that we propose to take up the subject in all its bearings, and provide something like a remedy for stagnant water under every possible disadvantage. The Fens of Lincolushire present us with a lesson that ought to be deeply engraven on the mind of every occupant of ground—a low and swampy level, below the bed of every adjacent river, often covered entirely with water, and always soddened, at one time worthless, and not only uncultivated, but uncultivable, presented no very great temptation to ownership. Common observers had considered it for years useless, because, as they thought, it could not be drained. It was not difficult to make a hole for the water to drain into, but the hole would immediately fill without any drains running into it, and there ended the hopes. However, men who thought a little beyond their neighbours could see that, if by any means

the water could be pumped from the hole up to a course that would take it away, all difficulties would cease ; and this was at length accomplished, without any run off, or any possibility of making one. The land was good for nothing ; but by setting pumps to work and raising the water from the hole to a channel far above the ground, and which would take it away as fast as it was pumped thence, the land was capable of being effectually drained by the constant application of mechanical power, and from being worthless became worth forty shillings an acre. Those who traverse the Fens now will see the mighty power of steam always at work, channels of running water, far above the level, made the receptacle of that pumped up from the reservoirs deep enough to receive the drainage from the lowest lands ; and the immense space which once produced coarse water-grass, and rushes, flags, and other aquatic weeds, now bearing six quarters of wheat per acre.

DRAINING WHERE THERE IS NO OUTLET.—We do not suppose there are many gardens situated so unfavourably as this ; but there are thousands of plots of ground occupied as gardens which are not only undrained, but which have no outlet for water, if the draining operation were performed. This is the worst position that a garden can be in ; and, do as we may, they cannot be drained effectually. However, much good may be done, and by no very costly means. Select the lowest part of the ground, if there be any difference, where to sink a reservoir, or what may be termed a pond. If the land be clay, it will only need to have the sides a little sloping. If it be light, sandy, or peaty, the sides must slope much more. The time for the operation must be when the land-water is lowest, the work being continued till you come to water each time you set at it ; and when that has gone off, to leave it dry, or comparatively dry, commence again, until you get it as deep as you require it—not less than four feet, and five would be better. Make a drain along the lowest part of the ground, three feet six inches deep, leading into this reservoir ; or, if the ground be such as to warrant it, let the reservoir be a proper ditch, the length of the lower end. Let there now be other drains made from the further part of the ground to this main drain, or ditch, whichever you have adopted ; these to be three feet six inches deep at the lower ends that come into the main drain, and to rise no more than is actually necessary to make a run of water, the shallowest not being less than

two feet, or two feet six, if it can be had ; these drains should run parallel, and one rod apart. All these drains should be made tapered to a point, thus **V**. The drains may be made with pipes of two-inch bore, laid end to end ; or, if these cannot be had, with large stones to fill up eight or ten inches of the drain, leaving, as they will, a run for water at the point, and forming, as they will, a run through the stones above. If neither large stones nor pipes can be had, get faggots, clippings of hedges, and such like open stuff, to occupy the drain as high up as we have mentioned ; or, if none of these can be had, cut the earth where it is stiffest into large lumps, so that when they are put in, they will not go to the bottom, but leave a vacancy.

When the best has been done that can be done under the circumstances for the preservation of a run of water, let all the drains be filled up to the surface, and a little above, to allow for settling down a little. But draining would seem labour in vain, if, in spite of all this, the reservoir gets choked up nearly to the top with water, and all the drains are full, which, of course, they must be, whenever the only outlet they have is choked up. Yet now comes the question of the good that is done by even this apology for draining.

All the water that is used for watering the garden may be taken out of this reservoir, and, if there be labour at command, this may be done rather copiously ; and although you cannot remove the liquid fast enough to make a serious difference in the height in the pond, the water in the drains continuing to supply it as fast as you take it away, the water is not stagnant altogether, and every gallon that they are relieved of is immediately supplied by the circumjacent moisture ; and this little movement, slight though it be, is of the greatest service. Again, as the land-water decreases, which at some portions of the year it will, even to the almost emptying of the pond, the land is actually relieved for a time, and the air, which does so much service to the ground, will find its way up the drains ; and, imperfect as this partial drainage may be, the produce of the ground, as compared with what it was before it was done, will amply repay for all the labour bestowed upon it. Of course, if there be an outlet of only the top few inches of the water, it is still better ; but we wish it to be understood, that if there can be no other relief than what is given by the constant use of the water for

irrigation, some essential service is rendered. How many thousand plots of ground, however, are there, where there is every convenience for draining, but where it is nevertheless neglected! And yet florists, professional as well as amateur, complain that their ranunculuses fail; that their tulips do not succeed as they could wish; that they cannot grow polyanthuses; that their pinks make no grass, and are often lost; that their roses do not bloom finely; and so on, *ad infinitum*, through the whole range of flowers that grow in beds and borders. In nine cases out of every ten, the fault is in the stagnant water beneath. How necessary it is, then, to drain their ground in the best way that circumstances will permit; and yet how difficult it is to move them to that very necessary operation.

NEGLECT OF DRAINING.—Volumes have been written, newspapers have been stuffed, essays upon essays have been published, with the best information upon the subject of draining, without, or nearly without, effect as regards farms, and almost entirely without any corresponding benefit among gardens. It is true, there are many productions of the garden which flourish in ill-drained ground. The tuberous iris and flag tribe grow healthy and robust, but they would do the same in a swamp; so that it must not be imagined that, because they do well, the bulbous iris is to flourish also. The finest collections of the English iris—so called because they have seeded freely and been raised abundantly in this country—have been known to dwindle away to nothing; while the sword-leaved, tuberous family have increased beyond all management. Nor must it be supposed that where the large and coarse varieties of the ranunculaceæ grow vigorously, the garden ranunculus must necessarily succeed. There is no affinity between the florists' improved and necessarily more tender kinds and their coarser predecessors or relations. The brier will flourish where the more splendid varieties of rose would die; and although many will flourish when grafted or budded on the dog-rose, there are many that will not succeed at all. In short, if we were to write for a week, we could not too strongly impress on the minds of gardeners the vast advantages derived from draining. We have known a lawn to be studded with fine shrubs, that have, after a while, stood almost still, and, after a little longer interval, begun to dwindle. We have seen the same lawn drained, without disturbing the

shrubs, and witnessed more growth in a single season than they had made the three previous years. We have seen that lawn in summer time as brown as the dead leaves that fall about in autumn, for want of draining, although it was a swamp in winter, and after rain; and, after the operation, it was never wet, nor was it ever off its fine green colour. But the same thing may be witnessed in a hundred places, if the same means be used.

Having shown how undrained and apparently undrainable land can be improved, under the most adverse circumstances, we shall touch upon the various modes adopted for the operation of draining under more advantageous features. The more complete and the deeper an outlet can be made for the superabundant water, the more complete will be the drainage; but something can always be done to help land.

ERRORS IN DRAINING.—One of the evils into which many fall is draining too near the surface. A stiff clay field of eight acres, on the side of a hill, and a lawn of two acres adjoining, but lower down, were some months in the year so wet as to be almost impassable on foot, and the feet of the cattle at these times would sink eight or nine inches deep. A man who had been employed in the neighbourhood to drain, was set to work at this; and finding an easy and pleasant descent, and the water so near the surface, he undertook to cure the evil by drains made diagonally from corner to corner, there being a capital outlet at both sides to a ditch of almost any capacity. The drains were two rods apart, and twenty inches deep, formed with flat sole-tiles, and an arch-tile on them. There happened a dry winter, and there was not much inconvenience; but under the scorching summer's sun, the earth cracked as heretofore; and the next being an ordinary season, there was not the least difference perceived. We were applied to for advice; ordered drains straight down the hill, to a cross-drain, large enough to take all the water; and, as expense was an object, we proposed trying the drains at two rods apart first, because there would be no expense lost, even if we had ultimately to make one between every two. The drains were made three feet six inches deep, and, before a tile was put down, every drain had a complete and copious run of water. Two-inch round tiles were laid at the bottom, and, as there happened to be on the field the clippings of the hedge which had been neglected, some of the bushes were put at

top, and then covered in with the whole of the soil, the turf relaid, forming for a time a complete bank along the surface of each drain. The run of water was complete; the drains run as freely now as they did when made, some years ago, and the ground seems of an entirely different nature: there is no cracking in hot weather, or softening in wet; the cattle make no marks, although, as it belongs to a private family, the season for feeding it is very little studied; and the drainage at two rods apart is sufficient. The men who made the drains sadly remonstrated against our orders for straight drains down the hill: they had been always used to diagonal drains on the side of hills. Common sense, however, ought to inform men that the more rapidly the water runs away, the more room is made for other water to fill the pipes, and that the greater the slope, the more rapid the fall. Some of the most antiquated notions regarding draining prevail in some places. The idea of our ordering three-feet-six drains, to which the labourers said it was impossible for the water to sink! They forgot, or had never considered, that if a pipe was a mile high, and the bottom half-inch cut off, the top half-inch would evidently fall half an inch as well as the bottom one; and so it is in draining. Run off a two-inch bore full of water from the bottom: it is immediately supplied by the nearest, whose place is filled by the next, and so on. The top must follow, and fill up the vacuum formed by the absence of any below; so that the effect is more instantaneous than many people imagine. Again, water will fall much more rapidly than it will travel sideways. If, then, a drain is made near the surface, it has very little to receive from above, and it can only take beyond this some of the side water in its immediate vicinity; but if drainage be deep, all immediately above falls perpendicularly, while right and left it comes in a sloping direction from a distance commensurate with the depth it has to come.

Many fall into an error which cannot be too speedily got rid of—that, if ground is on a hill, there can be no good in artificial draining, because there is a natural drainage. Nothing can be more erroneous than this opinion. Springs rise, on the side, and often on the top, or near the top, of a hill, and form swamps where you would think it almost impossible to retain water; and there is, in fact, no getting rid of it without properly draining it. Nor is it enough to make

ditches, ponds, and such like, to cure the land of its malady; thorough draining at a proper distance from the surface must be adopted; and according to the depth of the drains, so should be the extent of the bore in the pipe, and the distance from drain to drain. As to the direction in which the pipes and drains should be laid, all depends on the direction of the main drain, which should be along the lowest part of the land, whether that be at the end, the side, or along a hollow in the middle. This always saves labour, though it frequently happens that the only outlet we can get is not at the lowest part of the ground; and where such is the case, we must work down, so that even the shallowest of the draining shall be far enough from the surface to allow of all the operations in working above, without damage.

Draining becomes expensive according to the depth we have to go. In stiff clay-ground, near London, heavy contracts for the labour have been taken for three feet six inches depth, and exceedingly well made, at one shilling per rod, which includes making the drain, saving the top turf to lay on again, laying the pipes, filling up, and relaying the turf; and the men worked hard to make anything like good wages. In many parts of the country, where the wages are half the amount that is usually paid in the metropolis, contracts have been taken at less than half. But it may be taken as a rule, that the first cost in a garden should be in draining, for economy. To say nothing of the disappointment, the losses occasioned by cultivating upon undrained ground are incalculable. As we have before observed, thousands, finding their favourite flowers decline with them, attribute it to bad luck, want of attention, unhealthy plants or roots,—in short, to every cause but the right.

DRAIN-TILES.—In all draining, the principle is the same. There are many kinds of tiles—the flat tile, with an arched one like half a pipe laid on it; the two half-pipes laid one on another; ordinary pipes, with holes in them, to let in the water; and some with an oval bore: but there is nothing to beat the plain pipe: the holes do neither harm nor good; the water will find its way into the pipes at every join. The principal thing to look to is, that the drain is opened down to a proper depth, with a proper fall the whole distance; and that the bottom is firm enough to hold the pipes end to end, without danger of slipping up or down, or sideways, so that

the bores properly meet when put down, and cannot move afterwards. It must be remembered, too, that, however well ground may be naturally drained, it is always improved by artificial drainage. It lets air into the soil, and, as it were, keeps it alive. It aids greatly in the amelioration of the ground, and in almost every case improves the quality or the quantity of the crops, and generally both. To grow florists' flowers in undrained ground is a perpetual sacrifice. A man who does so had need be always buying, and yet will never be complete in his collections. Fruit-trees and kitchen-garden crops would in many cases be nearly doubled in produce, and improved in health; yet not one garden in a hundred is drained, unless the soil had been unworkable without it, and the operation had been forced on the occupier.

Nothing is more common than to hear people say of old gardens, that they are worn out; whereas the soil has been soured for years with stagnant water, which has been fed by the washings of whatever manure was applied, until all attempts to find appropriate dressings have failed to make any distinct improvement. The cause has been inefficient drainage, or none at all. The remedy is simple. In like manner, wall-fruit trees have, perhaps, been dwindling for years; the roots have got into sour soil, and cannot be healthy. The old soil is occasionally taken out, and new put to the borders; but if the ground be not drained, it is all labour in vain; the trees will continue unhealthy, the good soil will soon be as sour as that which has been removed, the trees condemned, new ones planted, and that only to decline, like the old ones, if the ground be not efficiently drained. In short, draining and trenching will cure the most sour and unproductive garden, if it be centuries old.

FURROW AND SURFACE.—In fields and farmlands, meadows, and the like, the farmers often resort to furrows, ditches, and what is called surface-draining. The objections to furrows and top-drains for arable land are not only the same as apply to all shallow drains, but the loss of ground is very great; and those who are content with this make-shift mode of getting rid of only a portion of the evil by the sacrifice of a considerable portion of good, may be called penny wise and pound foolish. Deep furrows between all the lands are a very temporary make-shift. There is nothing more annoying to a good farmer than to see, as he passes, the water lying in the furrows of a field,

and those furrows the only means of lessening the evil of non-drainage. If shallow drains, with proper drain-tiles, or pipes, are less effective than drains at a proper depth, how much less effective must be the furrows which are not even so deep! The water may be so high, or rather the ground may be so low, as to baffle all ordinary attempts to drain effectually; but there can always be something done; and be it remembered, that if a furrow only wastes a surface of a foot, and these are a rod apart, it is a sixteenth, or ten rods in every acre,—a quantity of land that would soon pay for draining most efficiently. Our business, however, is not so much with fields as gardens, orchards, and pleasure-grounds; and where the gardener sees trees unhealthy, shrubs of particular kinds dwindling, his choice flowers dying off, and things in general worse than his neighbours', let him seriously think of the panacea for nine evils out of ten that we suffer in a garden,—sound, effective, and efficient drainage. Then let him trench as low down as the soil is workable, replanting all the unhealthy shrubs and trees that are young enough to bear it, in the fresh-turned ground, and he will be rewarded the first season.

FENCING, WALLING, HEDGING.

The fencing of a piece of ground for the purposes of a garden, is a matter of some consideration, because—the difference in the cost of the various modes is one point; the intention as to shutting out the public, or allowing them to see over it, is another; the uses to which a fence may be put, is a third; and, fourthly, the general character of the neighbourhood, as to the disposition to trespass and thieve, is important. Fences of all kinds are costly. The post and rail is cheapest, but in this there is nothing to prevent animals, two-footed as well as four-footed of some kinds, from straying into the place. A boarded fence will not only keep out intruders, but it will be found useful for fruit-trees, although inferior to a wall. Pear-trees, morello cherries, currants and gooseberries, some kinds of plums, and, indeed, every fruit that will grow on a standard, will grow a little better, if not a great deal better, on a wood fence.

WOOD FENCES.—Of boarded fences, there are two: the park-paling, as it is called, made with ripped oak, of the height required, which is very good, but trees always suffer a

good deal from the wind blowing between the boards, sometimes sharp enough to blight all the fruit within its range; yellow deal weather-boarding is a favourite fence, but the boards soon spring and discover the vacancies between them; and these vacancies are as large as those between ripped oak-palings. We have seen boards made of inch stuff, edge to edge, and ploughed and tongued; but this comes expensive, and one might almost as well pay a trifle more, and have a brick wall. We have seen walls of four-inch brick-work, with a nine-inch pier every five feet; and for an internal wall within other premises of our own this might do. In fact, many orchards have such walls built in several places, for the sake of nailing trees to them, and for protecting a few warm borders. The best and cheapest, but not the most durable, is deal weather-boarding, as it is called; that is to say, boards an inch thick, perhaps, one side, and the eighth of an inch the other edge, and called feather-edged. This closely and properly nailed, so as to lap over each other a little, and well fastened to top, bottom, and middle rails, with strong posts every rod, and slight ones halfway between them, will, if well tarred or painted, and kept so, last many years. Ripped oak-palings would last a lifetime, or, perhaps, half-a-dozen lives, if but well soaked with tar once in three years; and though it is dear at first, it will be many years before it requires a nail to be driven, or any other kind of repair. A favourite paling in some neighbourhoods, on account of its strength, is formed with slabs, which are the first pieces cut off the trunks of trees, and are consequently flat on the sawed side, but have the roundness of the tree on the other. If these be straightened at the edges, and be nailed to correspondingly strong posts and rails, they form a first-rate fence, powerful against cattle, and tolerably lasting; in fact, if kept well painted, oiled, or tarred, the wear is endless. Open palisades are for the most part adapted for ornament, but there is no saving. Certainly, they admit more air to the borders, and let the public view the interior; but they are not advisable, unless it be for an internal fence, merely to part one portion of our ground from another. The making is as costly as a solid fence; the painting or tarring is quite as expensive, and nothing is gained by it, except it be appearance, which is a matter of taste.

There are other modes of making a fence, which may be cheaper where the wood can be had; this is, driving stakes

down a foot apart, along the boundary line, and twisting willow sticks between them, after the fashion of making a basket, but in a coarser way. This kind of fence is rather perishable, and is often adopted when a hedge is planted ; so that it is calculated the hedge will be ready to resist intruders by the time the wicker fence has worn out.

Another method of fencing is, to drive stakes sloping into the earth six inches or rather more apart, and then to drive a second row sloping the other way, and nailing or tying these, at the places where they cross, at least at some of them, to keep them firm and strong. These, however, are fences that will not last many years ; they would endure while a brier or thorn hedge is growing, and that is as much as they would. They take as little room as anything can, and so far they are better adapted for enclosures than banks and ditches ; for if there be any cattle loose near ditch and bank, they soon tread down the sides of the ditch into the bottom, and are not long, if neglected, before they make their way into the enclosure.

It is always a great point achieved if we can adapt the fence to the growth of trees, because it seems then to be of value. A close fence, too, is always a great protection to the borders on two sides of a garden ; and warm borders are always valuable. The question of whether you will have a ditch outside your fence or not, is also a question of whether you will waste a certain quantity of ground or not. If, however, it be desirable, for the sake of draining, it is another ; because, as you must have the ditch, it is better outside your fence than inside ; for your border is of far more value when backed by a close fence than at the edge of a ditch ; and no one would think of a ditch inside a fence. Then, however, comes another question. If there be no ditch, your fence should be four or five feet high at the least ; but if there be a ditch on the other side, a three-foot fence would be as effective as the five-foot one would be without the ditch, though it would be less useful for trees ; in fact, it would be of no use at all in that respect.

As an internal fence, merely to preserve a portion of ground from the intrusion of cattle, nothing is so cheap as fir poles and posts, which can be had very reasonably. Cut the fir-poles into any given lengths, that there may be some uniformity, and drive, or rather plant, strong posts in the ground

at such intervals as suit the poles. Two poles, one a foot and a half from the ground, and one three feet, or somewhere thereabouts, will make a fence sufficiently strong to keep off cows, bullocks, or horses; and nothing is so cheap in the way of a fence against large cattle. If sheep have to be kept out, there must be a third rail. This kind of fencing is often used when a border of kitchen garden is made in a paddock, or cattle have to be kept from plantations; but the most elegant fence is the iron hurdle, which may be calculated at a shilling a foot, and which is a completely invisible fence at a little distance.

BRICK WALLS.—As, however, an external boundary to a garden, there is nothing so good, so clean, so effective, so useful, and so durable, as a brick wall. It is of immeasurable value for fruit-trees. It should not, however, be less than ten feet high to be of the full value and use. Eight will do, nine is better, but ten best. In building a brick wall it is best to build to the extreme edge of the property. There are exceptions; and many old estates exhibit the ditch outside the wall, although next the public highway. This is inevitable when the adjoining land has the ditch on the premises, while you also have it on yours; the only way to avoid building within then, would be to arch it over, which, if there were any length, would cost more than the value of the ground recovered; and, if short, would not be worth touching. It is the builder's business to regulate the foundation according to the soil; but, if he has to go deep, you may lessen the intended height, or even lower the ground considerably on the inside, for the sake of gaining as much height as you can for the trees there. Nevertheless, if you lower the border next the wall, you must still slope it lower for ten feet from the wall; and the path must be made lower yet. The ground may be raised here and there with the soil you may have removed, as you may make in any part of the ground a bank for endive, or for strawberries. An external wall must not be less than nine inches in thickness; but, as we have already observed, where they are built within the premises, merely to part off a place, and are for fruit, we have known them to be built six feet high with single brick, or four-inch work, with nine-inch piers at distances of five or six feet, and such walls have answered every purpose for many years. We should not like to trust to such frail concerns; for

we should be afraid, while nailing the trees, that the whole concern would rattle about our ears, and destroy our fruit as well as the fragile fabric we were using.

HEDGING AND DITCHING.—We come now to the common way of taking in a piece of ground—hedging and ditching; the first step towards which is banking and ditching. If we make a taper ditch two feet wide at top and one foot wide at bottom, and throw the stuff out on one side, it will form a bank two feet wide at bottom and one foot wide at top, as high as the ditch is deep, that is, supposing we could make the bank as solid as the earth we disturbed; but, as it would—being loose—occupy a good deal more room, the bank would be much larger than the hole we had made. If there were any means of keeping intruders from damaging the ditch and bank, we would at once plant a double row of quicksets, that is to say, of thorns two years old; these cut down to six inches, or even three inches, would be a formidable finish to the top of the bank, and make a capital fence. But if there were any beasts in the neighbourhood, hedge, bank, and ditch would be soon destroyed altogether. We should, therefore, resort to some means of protecting the thing for three years; and the cheapest remedy is a railing of fir-poles, to keep cattle and horses from treading into the ditch. The quickset ought to be planted sloping outwards, about six inches up the bank; and, by making a kind of ledge there, that the water might all run away from the young plants when it rains, the hedge will very soon form an impenetrable barrier. All the quicks may be shortened to from three to six inches, according to their strength. At the end of the first year's growth, cut it down again to within a couple of inches of the first cut, and the consequence will be three or four shoots for every one cut off, and the hedge will be very thick and strong. At the end of the second year it may be cut back again either to a foot or fifteen inches, and from that time be trimmed into the form of a hog's back. Every weed that grows among the quick must be cleared out; for it is of the greatest consequence that it be kept clear. The bank may be lowered from time to time on the inside, and the ditch must always be kept clean; and the side of the ditch, forming of itself a bank, must be kept in good order. Every year the hedge must be trimmed in close, that it may thicken; and if it be well managed, scarcely a mouse can be got through it; whereas a hedge

neglected at first can never be made good, and if neglected at any time it soon gets bad.

QUICKSET HEDGE.—Quickset or thorn is not the only plant to form a good hedge ; few things beat holly. It can be grown as close as anything ; bears trimming and clipping to any form ; and when well managed in a hedge, is impervious to almost any vermin or animal. Holly, to form a good hedge, should be planted a foot apart in one row, and a second row six inches from it should have the plants also a foot apart ; but be alternated, so as to come, as it were, between the others. The cleaning of this while young is as essential as it is with thorns, but they will not require shortening. They must be allowed to grow into one another, the top not on any account shortened, but year after year allowed to grow up, until the hedge begins to close well, when the tops may be made even by cutting down any of the plants that get the start of the rest. The face, too, may be cut a little in, so as to check the outward growth of any inclined that way ; and both sides of the holly may be brought to a little more even face. As they thicken so must the face inside and out be clipped even ; and the more it is cut in, the better and thicker the surface becomes. The holly naturally feathers, as it is called, down to the ground ; but if weeds are allowed to choke the bottom part, the leaves would fall and the stems become bare ; but the holly will not bear cutting down while young. The leading branch has to make its way, and should not be shortened until it has attained the height required of it ; after which it may be clipped and turned into every imaginable form, and will show a surface so close as to defy any ordinary animal to penetrate it.

YEW HEDGE.—Hedges of yew are as close and useful as any in a garden. As a shade, it is the very best of all plants ; but, as it is at all times poisonous to animals, it should never be in parks or next the public highway, or anywhere within the reach of sheep, cattle, or horses. Therefore, as a boundary hedge it is objectionable, though as a garden hedge it is neat, may be cut into any form, grows exceedingly thick at bottom, very close on the surface, and the best for a thin hedge,—that is to say, shallow ; for if it were only a foot through, it would be thick as we call anything close ; and, in many gardens there are yew hedges as straight up as a wall, and as close and solid to all appearance ; for there is hardly vacancy enough

anywhere for a mouse. The yews may be planted a foot apart, and be allowed to grow into one another; which they soon will, cutting only the surface back and front to keep it all even. At first, of course, the clipping will be but slight, because they will not have grown much; but in three or four years they may be cut upright both at the front and at the back. The growth will soon be sufficient to enable you to form a flat green wall; and when it is high enough you may cut down the tops to the height you intend the hedge to be permanently.

PRIVET HEDGE.—The privet is a rapid growing shrub, and is greatly used for hedges where a quick growth is required. This is planted a foot apart, and cut down to six inches if a good bottom is wanted. In a single season it will go to almost any length; but cutting back is necessary to thicken it. A well managed privet hedge is a formidable barrier; but as it is nearly deciduous, it is not a favourite inside boundary; and until it is pretty old, and well managed all the time, it would be rather a weak affair to keep out cattle.

HORNBEAM HEDGE.—Hornbeam is a strong bush for a hedge. It will grow thick, and bear training to anything. We have, in our time, had to grub up a hornbeam hedge that had been well managed for years, after it had become a wooden wall of twelve feet high; but it had been then allowed to grow just at it pleased, and there was no doing anything with it but grub it up. This shrub or tree, for it is just what we like to make of it, soon grows into a hedge size; and from the instant it has attained the height you want, and you begin to trim it in, it forms timber, and its smallest branches get stiff; and it presents, in winter, a stack of hardened shoots that nobody could attempt to pass. As an exterior hedge it is, perhaps, as strong a one as you can adopt, and in time becomes almost a wooden wall; which looks solid in summer; and when the leaves have fallen, which is only just before the new ones come on, the wood itself seems to defy the passage of anything, however small.

OTHER HEDGES.—Many other plants make hedges for gardens. Messrs. Brown of Slough had, when they occupied the Royal Nursery, now Turner's, a hedge formed of the *Pyrus japonica*. Sweetbrier hedges are great favourites, for the exquisite perfume of the foliage, while they become strong barriers as they get matured. The hedge-nut, or nut

generally, has been used as a hedge; but when constantly cut in it never bears, so that when used as a hedge it is inferior to most others; while, most likely, the object with which they were first planted as a hedge was the bearing, which the clipping prevents. We need not go to the cactus or agave hedges of South America, our object being more immediately at home.

MANAGEMENT OF HEDGES.—Whatever may be the material of which the hedge is composed, regard must always be had to its branching near the ground. It is not necessary to have a ditch for the success of a hedge; but hedges are adopted as appropriate finishes. Nothing can look more desolate than a single ditch and bank; therefore it is natural that there should be something; but, as the ditch is only useful when it acts as a drain, it does not follow that there shall be either bank or ditch made. Where these are unnecessary, the only things requisite for the welfare of the hedge are, that the plants shall be young, the roots good, the ground prepared by good manuring and trenching, good watering, following good planting, and the whole protected against the least disturbance by animals of any kind. The cutting back may be good for privet, hornbeam, thorn or quickset, sweetbrier, and such like; and four inches above-ground enough for either of them; but the yew and the holly must not be cut back, nor must they be touched with the knife, except to cut off all the bruised ends of the roots and the broken pieces. They must not be touched till they have grown larger than you want them; and then they must only be cut within the bounds that they are intended to be grown. If the hedge is to be a foot and a half thick at the bottom, do not take off a leaf within that thickness; wait patiently until the growth exceeds those bounds, and then cut them merely to the right place. By the same rule, if you want the hedge to be four feet high, do not touch a leaf that has not passed that boundary; because you want every leaf till that space is filled, and should touch none but those which exceed these limits. In the best gardens hornbeam, yew, holly, and other hedges, enclosing three sides perhaps, and sometimes nearly the fourth, of a square, afford shelter for the greenhouse plants and heaths turned out of the houses; keeping off the violent heat of the sun, yet not depriving them of air; and, at the same time, shielding them from the winds. These hedges are found to be of the greatest

service in general nurseries ; for many of the tender plants that have to be turned out of the houses would be destroyed if exposed to the sun and wind, however carefully and frequently they might be attended to.

Hedges, when grown old and open at bottom, long upon their stems and straggling, can only be renewed by what is called plashing. The thorn, if cut half-way through and laid along the bottom, will live just as well as if it had been left towering aloft. Therefore, those who go in earnest to mend a hedge will first clear out all the weeds and intruders from the bottom, and then cut away the uncouth pollard-like heads that have been formed by old and repeated headings, and save all the shoots that go up from the bottom of any manageable size ; then, by cutting these pretty nearly half-way through, and bending them down, they can be backed in among the stumps at the bottom and pretty close down ; and independently of their forming a sort of rail, they break out into shoots the whole length, and erect a new hedge. It is not one shoot, but all the strong shoots that are of the least use that are served this way ; so that a new hedge is formed as thick as we would wish in a single season ; and the vigorous growing shoots only require to be cut in to continue thickening. The hedge is thus completely renewed. But the yew, holly, and others will not bear this. If they get out of condition, hollow, or bare, it is of no use trying to remedy the evil ; other plants must be placed to make up vacancies, if the place be clear enough, but, in a general way, it is better to level everything ; grub up all that are not perfectly healthy, trench and dress the ground all along, and plant, at the right season, new trees or other shrubs to complete the hedge—new in all parts but where the beauty of an old specimen may have tempted us to spare it. It is but labour in vain to half mend a hedge, or to plant new young plants without thoroughly trenching, dressing, and preparing the ground, taking out all the old stumps and roots, and commencing anew. One might be tempted, if we could get them, to use larger stuff than a new hedge is generally planted with, but that is all we should do.

THE ORCHARD.

The true orchard should be laid down in grass, except only a border round the outside, which should be walled for trees of the more tender kind, as vines. It is not always that we can have everything we desire ; but we are speaking of a proper orchard. The walls should be from eight to ten feet high at the least, and appropriate trees should be planted according to the aspect. Nectarines, peaches, apricots, and plums should be on the sides most exposed to the sun ; cherries, especially morellos, on the walls which have the least ; not that they would not all be better for a warm aspect, but that some will do well on the north-east, against which others would not succeed at all. It would be necessary to hurdle off the borders, if it were contemplated to turn sheep out for the grass ; but the grass might be always cut and made into hay, or carried to be consumed green. It is common, however, to use the ground for garden or field-crops, the first three or four years after planting, until the trees grow up a little, and to lay it down in grass when they have become robust enough to sustain no damage from sheep.

CHOICE OF TREES.—Much of the labour in forming an orchard depends on the soil ; for if it be not appropriate,—that is to say, if the soil be not good, and of tolerable depth,—sufficient must be removed for every tree, and proper soil be provided. The standard trees ought to consist of the best pears, apples, cherries, the rougher kind of plums, damsons, medlars, a quince or two ; and the proportion must be according to the probable wants of a family. Suppose an orchard to comprise an acre, make a ten-foot border all round, and plant no tree more than ten feet from the edge of the border. As room is an object, let the trees be planted in rows from east to west, not less than a rod apart in the rows, nor less than two rods from row to row. The walls may not be even, but the planting should be, though it may be diagonally. It will be obvious that the fruit will derive more advantage from the sun in such an arrangement than by any other ; and it will be found that when they are becoming full-grown, they will almost touch each other in the rows, while the double distances between the rows will give them great advantages. It will be found, generally, that there may

be two gatherings, the fruit on the south side being ready before that on the north. Of course we do not allude to the young state of the trees, because the sun will go through them; but when they become matured, and of a size to bear largely, however well they may be pruned and trained, there will be a difference.

PREPARING THE GROUND.—If there be from twenty inches to two feet thickness of good loam, the only preparation required will be to trench the ground well before planting. If there be but one foot or less, there must be a removal of the soil for each tree. Dig the good soil out four feet in diameter, and throw it in a heap on one side; then remove the bad, to make the hole two feet deep, and lay it in another heap; throw in the good soil, and from between the lines of trees, dig the top spit off, and fill up the hole more than full, to allow for settling. The bad soil may be placed where the top spit came off; and this should be done all over the ground,—that is to say, the holes should be made all over the space at the distances mentioned, and thus filled up; the line for the trees need not be distributed more than four feet wide, which, considering how few things do any good under trees, will cause but small sacrifice. The borders must be prepared in the same way as the single holes; that is to say, the best, or top spit, removed, to get at the bad soil, and throw it out; and the easiest way to do this will be, to devote the ten feet next the border, to furnish the top spit, and to take the bad.

Draining in the orchard is absolutely necessary. It is impossible without that fruit-trees can do well long together. It is therefore essential to see that the ground be well drained before planting. The first concern is to find an outlet for the water, and make it as deep as will take the running from a three-feet-six drain. Let a drain be made along the lowest portion of the ground, four feet deep, and into this bring down drains three feet six from the surface, eighteen inches to two feet wide at the top, and sloped to a mere point at the bottom. The drains should be opened one rod apart, in parallel lines, from the highest to the lowest part of the ground. This will be found sufficient for the stiffest and wettest land; but inasmuch as, unless there be a natural drainage perfectly effective in itself, all ground requires draining, or is at the least the better for it, this rather

belongs to the very first operations after we get possession than to any of the after details ; and the entire space, whatever be its destination, should undergo the process, before we even begin to lay it out.

The drainage of the fruit-borders is so essential, that it is frequently done when no other part of the ground is drained ; and the bottoms are often formed of hard, dry substances, such as flints, stones, brick-rubbish, or other material impervious to the roots of the trees ; and a good drain carried along under the path, with large draining-tiles, or, for want of such material, with boulders, or stones, to half fill it ; or, in the absence of this, with bushes, through which the water can percolate at all times to a regular outlet somewhere : but we have gone more at length into this matter under the head of "General Draining of Land."

The fruit-borders require two feet of good strong loam. It is the practice of many to make up these borders of compost, frequently procured at great expense ; but, generally speaking, the top spit of any ordinary land is good enough ; and if not, may be enriched a little with ordinary dung. In grapes, many persons are extravagant, and employ all sorts of animal manures, to an extent scarcely credible. Sufficient, however, for all ordinary purposes, will be the top spit of a pasture, with after applications. It is quite certain that vines are the most petted and ill-used plants in the world. They are pampered up with every rich ingredient that fancy can contemplate, or they are thoroughly neglected ; and thousands of excellent vines, in fine bearing for as many years back as "the oldest inhabitant" can recollect, have had nothing applied but the pruning-knife ; and perhaps it would be difficult to find their roots, even if the owners wished to dress them.

FRUIT-BORDERS.—For a newly-formed fruit-border we should be content with two feet of the best soil the orchard could produce, robbing the surface where there were no trees, to make up the necessary thickness of good soil where the trees were to be planted. With a ten-feet wide border thus formed and drained, and even without taking the slightest trouble about the bottom of the border, we should set about planting the wall-trees.

TREES TO CHOOSE.—If we were impatient, we should get all the trees trained to our hand ; but there must be the

greatest care used in selecting good healthy specimens, that have not made too much wood the last year; nor should we be over anxious to purchase where they were grown with remarkable vigour, for the change very frequently throws them back so much, that we should be actually forwarder with maiden trees, or at the most with a second year's growth on them. A few rules may be attended to with great advantage:—first, on no account remove a tree until the wood is well ripened, and every leaf has fallen; secondly, remove them as soon as possible after they have fairly ripened; thirdly, take up every fibre of the root, if possible, without bruising or breaking; fourthly, if, despite of all our care, the roots have been broken or bruised, cut off every damaged, every bruised end, and every broken part, with a clean sharp knife, for every bruise on a root will generally canker, and this commences a slow but generally sure decay; fifthly, if by this operation the root has lost much, let the head be pruned in proportion, by shortening the vigorous branches, and cutting out altogether all weak and superfluous shoots.

If you obtain maiden trees, use the same care in taking up the roots whole; but as maiden trees have but one year's growth upon them from the bud, or graft, they are cut back to three eyes, and no more. Take care to compensate for lost roots, if they are damaged, to the greatest extent, or you lose growth in proportion.

PLANTING THE TREES.—The planting of the wall-fruit trees is simple enough. They should be put a foot from the wall, and be sloped to it; and on no account should they be put in the ground lower than the collar of the root. The roots should be spread outwards, and, when well trodden in, so fixed in the place as to be undisturbed by winds. With regard to the border, it need not be wasted; but whatever crop may be placed in it, there should be room for the sun to reach the earth. Any crop that shades the whole surface will be injurious; and the best management is, perhaps, to use it for strawberries, for a time at least, but to allow every plant a yard. It may not be of much importance the first two or three years, because the roots have not time to spread; but when they reach all across the border, which they will in time, the sun must not be kept off by anything. Whatever is put on the border must be dwarf and distant, and the top-dressing must be ample, to compensate for the requirements of the crop.

It may do well to get up all the small early spring crops on ; that is, turn it into culinary purposes. Radishes, onions, lettuces, are protected all winter by straw or litter. These cannot hurt, for while the crops have all the sun, they are not large enough to keep the heat from the border. For the sorts of fruit best adapted for the orchard, and the proportions of each, see the Appendix. Much depends upon the fancy of the owner. There are, however, some fruits of which it is almost impossible to have too many. Green-gage plums are not only the finest luxury in the world, as a fruit, well ripened, but are unrivalled as a preserve, and good in all their stages as a tart-fruit. Morello cherries not only hang a long while on a tree, but they are also excellent as a preserve, and make a splendid wine ; whereas, the more delicate kinds of fruit, such as the peach, apricot, and nectarine, though delicious when in perfection, are not so useful as cherries and green-gage plums when abundant.

PREPARING POOR GROUND.—Supposing the space devoted to an orchard is poor all over, and requires the holes and borders to be prepared as we have directed, the work will be simplified by driving lines, and marking spaces four feet wide the whole line of the trees, and at once digging off the good soil the whole length, and throwing the stuff outside. Then, as you dig the holes, a rod apart, and four feet in diameter, you can throw out all the bad stuff on to the line you have cleared the good from, and fill up the holes with the good soil on the sides to the height of the old surface, and as much higher as will allow of its settling down to the original height of the surface. When all the bad soil has been equally distributed along the line which has been denuded of the good soil, the remainder of the good may be equally distributed over the surface, and thus form an excellent top for sowing grass. If the orchard is to be used for crops while the trees are growing robust, it is obvious there need be nothing placed on the four-foot width on which the trees are planted. But in the width of one rod taken from the centre between two rows of trees, there may be gooseberries, currants, raspberries in their best varieties, giving them ample room,—gooseberries and currants six feet apart, raspberries in rows six feet asunder, and four feet from plant to plant in the row. These three fruits are always useful, in whatever abundance they may be grown : as tart-fruit, preserves, or for wine they are equally

valuable ; while in the dessert, when in fine condition, they are especial favourites. Under the trees, and for six feet on each side, the impoverished under soil may be at once sown with grass seeds, to be cut for packing, or to be consumed green. Grass under trees is a great protection to fruit that fall, as they take much less damage than they would from the hard ground, or the earth and stones where dug up ; and the principal thing to attend to is, the frequent cutting of the grass, to prevent it from seeding, and the seeds from blowing over the dug parts. The devotion of the whole enclosure to orchard purposes will be found advantageous. Even the gooseberries, currants, and raspberries, usually grown in the kitchen-garden, are better grown here ; and if you will but give room enough to the strawberries to prevent them covering the surface, they will do well on the warm borders, without doing much harm to the roots of the wall-trees.

If the orchard were laid out and planted in this way, the trees would be in rows upon grass slips one rod wide ; the gooseberries, currants, and raspberries would be on slips one rod wide between the trees, and a border all round may be turned to some account at all times.

Next to having an orchard as we like, we must have it as we can get it ; and in very many cases the orchard will be confined to standard trees, and the boundaries mere hedges and ditches, instead of walls ; in which case the fruit will be confined to the more hardy kinds. Green-gages will do on standards, also all the kinds of plums and cherries ; but it is a waste of time, money, and patience, to try peaches, apricots, and nectarines, on standard trees ; they will not ripen one season in ten, and, therefore, only lead to disappointment. The best chance we have of ripening such fruit without walls, is, to grow the trees very dwarf on espaliers, so that the earth shall perform some of the part which the wall does—that is, reflect the heat a little ; but it is all mere make-shift, and it is as well to do without the fruit always, as to be disappointed even twice out of three seasons, which we assuredly should be in this country. Again, there are some who would be at the expense of building a wall on the warm side of a plot of ground destined for an orchard, who would not think the use of a wall on the cold side any fair compensation for the cost ; and there may be some reason in this ; because, however we may use a north-east aspect for certain fruits that will stand

it, there is no comparison between the fruit so produced and that grown on a south-west aspect. We have seen frequently a morello cherry on the north side of a wall, and as the branches reached the top, and continued growing, trained down on the south side. The fruit on the warm side has been more than twice the weight, and a month earlier, as compared with that on the north side, though of course the fruit was from the same tree. We can, however, hardly imagine a prettier sight than a neat orchard, walled in, with the trees planted on slips of grass stretching from east to west, and the smaller trees, or bushes, on other slips of ground turned up, and neatly planted and pruned.

If the soil of a place destined for an orchard be moderately good, it is desirable to do nothing but properly drain it, and trench it two feet deep, planting at the distances before mentioned. If trees can be got quite healthy, of not too vigorous a growth, and that have been planted out not more than two years, they will come into bearing early, and repay for all the trouble of taking up very carefully ; but if there be any check given to trees so forward, it is great odds that younger ones, only two years grafted, will overtake them, and pass them both in growth and bearing.

SELECTING FRUIT.—In selecting fruit, set the highest value upon the sorts which keep well. There are many which do not ; and of these one or two trees will be enough, because they will perish before the crop of two trees could be consumed in the ordinary way. What pear is more beautiful or more luscious than the Jargonelle in fine order ? Yet, when they are once fit to eat, they are almost immediately gone by. Three weeks, at any rate, would comprise the first and the last keeping, and sometimes a fortnight. There are apples quite as fine to eat, and as rapid in their decay ; and these should be avoided, except so far as one or two trees are concerned. But there are sorts of apples and pears that remain good a long time ; and to these we may devote a much larger space. Take, for example, the ribstone-pippin, for an apple. This will keep in fine eating condition for months, and is almost without a rival in flavour, in texture, and in usefulness, as a culinary, as well as a dessert apple. In pears, there is no difficulty in choosing sorts equally well adapted for the dessert, and possessing the great recommendation of keeping a considerable time. There are, however, many pears which,

being gathered before they ripen, keep some months in the fruit-room; but when they become ripe must be consumed rather rapidly, because they decay soon after they are ripe. In growing fruit, therefore, all these things ought to be considered while we are settling in our minds the proportion we should grow of each sort, always bearing in mind that the less a fruit will bear keeping, the less we ought to grow, and *vice versa*.

THE FRUIT-ROOM.—Connected with the orchard is, or ought to be, the fruit-room. This should be as cool as possible, and as close as possible, free from damp and draught, and capable of being thoroughly protected from frost. The shelves should be open bars, and on the edges proper ledges four inches high, to prevent any from rolling off. On these shelves should be evenly spread clean straw, an inch in thickness; and on this straw may the fruit be laid, the more delicate sorts singly; the robust may be one on another, and even heaped as high as they will lay well. Many pack fruit in barrels and boxes, some in sand, some in bran; but we have been quite satisfied with the degree of keeping that we could secure on the shelves we have described. Fruit should be gathered when thoroughly dry, and carefully laid in the basket into which it is gathered. Letting them fall into the basket, or throwing them in, is too frequently practised; but wherever there is a bruise, the decay will begin, and seasons very often get blamed for decay which originates in careless gathering. When they have been placed in the fruit-room a few days, they will have become quite wet, they should then be wiped dry, and be replaced. We have never found much inconvenience in this mode of preserving fruit; and if there be abundance of shelves, it is quite impossible to improve upon it for being convenient and easy of reference, because all the fruit may be in sight at once. The best time to gather apples and pears of the keeping kinds is, when the pips have begun to tinge with colour. If gathered before this, the fruit will not attain its proper flavour; if after this, they will not keep so long. It is therefore requisite that, when we think a crop is ready, we should open one, to see if the pips have begun to tinge with yellow or brown, as if commencing their ripening. If they have, gather in the middle of the day, as soon as you can, and store them, placing all the sorts that do not keep long in the partitions handy for frequent examination; and those which will keep, in the most

remote ones, where they need not be disturbed. As soon as there is the least symptom of decay in any lot of fruit, examine every one of that sort, and remove those that are affected, as the decay frequently spreads by mere contact, and if neglected, might prematurely destroy a whole stock.

THE FORCING GROUND.

The setting off a portion of the garden to conduct all the forcing, is a very desirable step ; because, for the most part, it must be occasionally in a litter with hot dung and other fermenting materials ; and where the spits and houses are heated with hot water or flues, there must be the usual quantity of stoke-holes and fuel. The forcing-houses, frames, and pits, should all be built with a south aspect.

HEATING.—The heating should be in some degree on the principle laid down by the late Mr. Penn, of Lewisham, who, however unfortunate in the early applications of his invention, unquestionably hit upon one of the most valuable features in the structure of hothouses. The principle is this : we all should know that warm air ascends from any heated surface ; that as it cools, it descends again, comes to the heated surface, and, when heated, goes away. So that, so far as obstructions do not prevent it, the air in a heated house constantly circulates ; and if the heated pipes were placed on the low side of a house, and there was a flat flooring, the heated air would go up to the roof ; as it cooled, it would descend the back wall, and, crossing the floor, it would supply the place of the heated air going off, be heated itself in turn, and so constantly circulate. A pit built in the middle of a house would seriously impede and interrupt this circulation ; the air could not cross the floor, but must go round the pit to get at the hot pipes again. Now Mr. Penn got over all this difficulty, and greatly increased the rapidity of the circulation, by first of all building the houses with a false, or raised floor, with a grating all along under the pipes in front, and another grating all along the back, so that the air, as it cooled, descended to the back grating, rushed, as it were, under the floor, and came up again to supply the pipes with air to warm as fast as that which was warmed went off. Mr. Penn partially closed the pipes in a chamber, as it were, open at bottom to the grating through which the air came to be heated, and also at top, to

let off the air as fast as it was heated ; and the rapidity of the circulation actually kept some of the leaves of the plants in motion. Among details, we may mention, that if fresh air was required in the house, apertures could be opened to admit it under the pipes, that it might be heated as it passed. The principle can be used in a pit, as well as in a stove ; but it answers no purpose for any houses that are not kept tolerably hot. It is of no use in greenhouses ; for, as we never heat them at all, if we can help it, and there is no circulation created without, the whole extra expense would be lost.

The most economical mode of forcing, upon the whole, is a judicious application of hot water ; whether applied by tank or pipes, it requires less attention than any other mode. For grapes and pines in the same house, nothing, perhaps, is more general than a good tan-pit in the middle of the house, and hot-water-pipes, in less quantity than would otherwise be required, along the lowest part of the house.

The forcing-ground should contain sufficient building to do all the work required. No place should be crowded. A peach and nectarine house should be required to do nothing else. Many excellent gardeners will have nothing of any consequence with their vines, although for the most part they occupy the roof only. Where there are pines, the vines should only occupy the rafters, so that the sun may not be taken from the pines. Melon frames or pits, and the same for cucumbers, may be constructed on fifty different plans, and heated by half as many ; but the good gardener shows his skill by the simple means which he requires, and the ability to accomplish his object at the least expense.

FORCING PITS.—It is not uncommon in gentlemen's establishments to find every variety of costly erections, all manner of whimsical constructions, adopted for the purposes of forcing ; and it is creditable to the profession that we may at the same time find a man capable of competing, in every respect, with the most fortunate of these well-appointed places, with nothing but a common dung-bed for his cucumbers and melons, an old-fashioned brick flue for his pines, grapes, peach-houses, and even cherries in pots. We are perfectly aware that certain plans save a good deal of trouble and anxiety ; and, as such, recommend everybody who can afford it to have convenient erections and hot-water apparatus ; the most simple, the most economical and effective of which

is a common conical boiler, of a proper size, with pipes in proportion to the work they have to do ; and as they require very little attention, it is better to let there be several of these than it is to have too many things heated by the same boiler, be the construction what it may. The less complicated everything is, and the less expensive it is, in the construction as well as in use, the better. A range of pits—say four feet high in front, twelve feet from back to front, ten feet high at the back, with a good shelf within two feet of the roof, a tan-pit along the centre, three feet from the front and the like from the back, three feet six inches high in front, and five feet at back—will be found as useful, for nearly every kind of forcing in pots, as any other that can be adopted. The whole of these should be built with the bottoms off the ground, which can be accomplished by single courses of bricks on edge, every three feet, from back to front, and stones or slates laid on of proper width, a grating of iron being along the front next the wall, one foot wide, and the back path to have a grating about twice the width. These gratings form a direct communication with the hollow below the false bottom of the house. A good shelf may be placed along the front of the house, one foot, or even eighteen inches wide, and something between them ; because these forcing-houses, or pits, are not made to walk about in ; and the fewer people go in and out, except those engaged, the better ; so that convenience, by means of wide paths and abundance of walking-room, is not to be studied for an instant. The iron piping required for this building, in addition to the ordinary heat of the tan, will be two four-inch pipes the whole length of the front, the one close to the wall, the other a little below, but occupying a second width, for the purpose of covering, as it were, as nearly as may be, the width of the grating ; and the heating will be still more complete, if there be a row of paving-tiles along the path, to confine the air that comes through the grating, and force it to pass close to the pipes. One of these pipes ought to be nearly close to the ground, and the other six inches from it. All the air that comes through the grating will be heated as it passes the pipes ; and when it has traversed the upper part of the house, and cooled a little, it will naturally descend through the grating behind, and be drawn to the front, to be heated again. The shelf in front should be formed of bars, that it may not inter-

rupt the progress of the heated air ; and that at the back should be similar, that the descent may not be checked. By this simple contrivance, which is by no means expensive, the circulation of air in the house will be pretty nearly as complete as it is in the open ground ; and as a proof that it is healthy for plants, if you shut yourself up in the house, you feel all the warmth, but none of the oppression, which we all experience in a close stove.

The admission of air may be at the back of the house near the ground as well as anywhere, for it will make for the pipes through the floor, and be warmed before it reaches the plants ; but if you desire to cool the house, the opening of a top-light a little, to let off the heated atmosphere, will be desirable. A very small opening and a corresponding admission of fresh air below will be found sufficient ; but when the doors are frequently opened, the lights will seldom require to be removed. This, however, depends much on what is to be done.

In a pit like this, fruit-trees in pots, pine-apples, strawberries, and French beans may be forced in perfection ; grapes or cucumbers can be forced upon the rafters ; and it will be found more easily managed and controlled, as it were, than any other construction that can be made ; nor is there anything expensive about it. The glass of the roof may be six inches wide, and any size from four inches upwards ; the top light, or every alternate light, may be made to slide down : everything about it is of the plainest work. The cheapest of all boilers to buy, to fix, and to supply with fuel, is a common conical boiler, and the size must be in proportion to the length of the pit, (which may be fifty or five hundred feet, according to the work required to be done,) and whoever supplies it will make it of a proper size according to the length of pipe it has to heat. Whatever a house may be destined for, the only difference we should make would be in the internal arrangements. If for peaches, nectarines, or figs, or apricots planted in the ground, the interior must form a trellis on which the trees should be trained. If for vines, especially, and to be brought in a season that admits of no other forcing, the interior must have no stage, nor pit ; but even then, mushrooms may be forced on the ground without the least detriment to the fruit of the vines, the bed being made on the floor of the house, and merely covered with straw to keep the sun off. Many, however, get a stage, and

grow chilies and capsicums under the vine ; but whatever it be, it should be capable of bearing all the treatment the vine requires at whatever season it may be forced, because everything must give way to the proper management of that ; and things that will not bear it have no business there.

FORCING VEGETABLES.—Many things may be forced in a common dung hot-bed with a garden-frame and light. Strawberries and French beans planted in the bed with a proper thickness of soil—say eight or ten inches—may be managed to a nicety ; for it is easy for a practised hand to regulate the heat of a dung-bed, as others may regulate the more elaborately perfect contrivances. Potatoes are well forced in common garden-frames and lights. We have known Mr. Chapman, of Brentford End, to force one thousand lights in a season, so that there is very little difficulty in the matter. Rhubarb and sea-kale should be forced in the proper forcing-ground, for it is very littery and ugly in the ordinary kitchen-garden ; and the plan generally adopted now is to sacrifice the plants, which are grown in the open air, as asparagus-plants are, until three years old, and then put as close together in frames as they can be packed, covered with six inches to eight inches of ashes, sand, or common light soil, and set to work until they break through the surface, when they are known to be ready. Asparagus has long been forced in common hot-beds in the same way, the roots placed side by side as thick as they can be packed, and covered with three to six inches of soil. Those who, like ourselves, are content with short but eatable “grass,” as it is called, cover with three inches, allow it to grow four inches above the surface, and cut two inches below ; others, who want three or four times as much white tough stick, to an inch of eatable stuff, put six inches of soil on the crown of the root, and cut four or five below the surface ; but it is to be considered that at market people expect a great show, and that the white portion, though useless, is necessary for sale. The ordinary way of forcing kale, by covering the plants with a pot, and surrounding it with hot stable-dung, will do where the plantations are permanent ; but growing the roots up for forcing, and making one hot-bed hold many plants, is far the best plan when a large supply is required.

The forcing-ground should contain sufficient space to take in a considerable number of common hot-beds, made under frames

and glasses, for there are few things that may not be forced by such means, and they may always be increased by adding them when the demand for anything justifies it. Stoves, pineries, forcing-pits, &c., should be for the winter months, seventy to seventy-five degrees by day, sixty to sixty-five degrees by night; for the summer, eighty-five to ninety degrees by day, and sixty-five to seventy degrees by night.

TANNER'S BARK.—One of the most useful materials in the forcing-ground. Pits are filled with it to produce a genial bottom heat, and pine-apples are rarely grown without it. There is no material that holds a moderate warmth so long, and when it has rotted it is a good fertilizer of the ground. As a proof that it is highly nourishing, if a plant be plunged in it and the roots get through the bottom of the pot, the plant—it matters not what plant—grows more vigorously than ever, and the more decayed the tan may be, the more robust the growth. We have had *cucumbers* plunged in tan to grow on the roof of the hot-house, and have calculated on renewing the plants as the old ones get lazy, but all at once they have become stronger, put out new shoots, and gone on till the end of the season, when we were obliged to change the tan, and found the roots of the cucumber rambling among it in all directions. *Passiflora Bonapartia* and other flowers have exhibited the same propensity for luxuriating in the decayed bark, and on one occasion we put in the proportion of nine barrows to a bed four feet wide and thirty-six feet long, spreading it equally and digging it in, and the same of dung from an old melon bed. Half a dozen beds were done each way. We think those with the dung had the advantage the first season, if there was a difference; but the second, those dressed with the tan far outdid the others, and there was a bed each of half a dozen subjects, and a fair trial. After the first year the tan had it, and we could come to no other conclusion than that the decayed tan was a first-rate dressing for flowers. The pits made within houses should be as much higher behind than they are in front as the roof is; in other words, it should be the same slope as the glass, that things may be at the same distance, whether they are plunged in the front or at the back. For convenience the pit should be so built that there shall be room to go round it; and that it may be as large as the house will admit, the path should not be more than eighteen inches to two feet wide. The pit is merely a receptacle to hold the

tan. It may be a foot deeper than the floor of the house, to hold the greater body of tanner's bark ; it may be three feet six inches above the pavement or path in front, and the rise up to the back to be dictated by the slope of the roof. Four-inch brickwork is thick enough, and room is an object. This should be filled with tan rather heaped up, for it settles down very considerably. Thrust a stake down sloping to reach the middle, that by pulling it out you may feel the heat of the bed. This bed will supply bottom heat for pines, cuttings of all sorts, plants that want to be pushed on a little, tropical seeds and flowers that are to be forced. In all these cases, the pots or pans are plunged to the rims, and they must be liberally watered, but not till the surface of the soil they are in is dry. But it is necessary to keep the atmosphere moist ; this is easiest done by frequently sprinkling the floor of the stove and the hot-water pipes. This raises a steam which is beneficial to all kinds of plants, even if any are in bloom it does not disturb them, it merely settles down something like the finest dew. Tan requires to be partly renewed every year ; this is generally done by sifting all the decayed stuff out, using the large over again, mixed with enough new tan to fill up the place.

THE FORMATION OF PLEASURE GROUNDS.

There is nothing less understood among ordinary gardeners than the disposal of ground to advantage by the laying-out of those portions which are nearest the house with a view to ornament. Men generally apportion their walks and groups of shrubs and trees according to the size of the ground, as if the persons who walk about could change their size to fit a narrow way. It cannot be in good taste to attempt more than can be accomplished well. All large estates, even forests themselves, have beautiful spots, and we cannot do better than imitate by art, in style at least, whatever is beautiful in nature. If we attempt in an acre of ground to produce too many features, we spoil them all ; for inasmuch as none ought to be insignificantly small, many would so crowd the place as to leave no expanse for lawn ; and if the features are imitated on a small scale, everything looks poor and babylike.

If you want a summer-house, let it be of a size that a party can enjoy themselves in ; not a pimping cupboard of a place,

with scarcely room for a table and chairs. Choose an appropriate place for it, generally a spot that commands fine views. Let it be raised a step or two, or even more, if there be any object in it. Place it close to the boundary, that the space before it may be as large as is practicable. If you can find pillars of any architectural beauty, and a portico-like top, it will be the most effective model you can take. If you have to build it new, pilasters will be cheaper, and, if not quite so effective, at least neat and elegant.

PATHS.—The next object is to form the path round the garden, as near the boundary as you can well bring it, so that you do not prevent the ordinary means used to conceal the extent. The outer portion of the ground always requires to be planted well, but so form these borders of shrubs as to give variety to the scene. If the garden be square and much confined it will cause some trouble; but let not the path be conducted in sharp corners or elbows; a graceful turn at all points, and nowhere abrupt. The borders must not be carried in the same line as the path; the verges should be of turf, a foot wide at least; the border unequal in width, and the path sometimes approaching it, at other places receding from it; the border sometimes showing a projecting breastwork of fine shrubs, up close to the path, at other places leaving a wide space of green turf, like the middle portion of the lawn. The path should not be less than six or eight feet wide, and the centre of the lawn should be clear of all specimens or beds, for there is no means of showing space off to so much advantage as the keeping as much of it within the range of the eye as possible. It is almost impossible to set down any rule, because scarcely two places present the same objects, the same means, and the same features. Clumps should never be farther from the edge of the path than the width of the verge which is left any where. Whatever size you have your bed or clump, whatever form it is to assume, the portion next the path is to be cut to within the foot verge, and never should there be more or less width of verge; consequently, all the fancy form must be away from the path, that is, the side opposite the path.

CLUMPS.—Clumps may be of any odd form, any whimsical shape, without destroying the general effect, if attention be paid to the narrow verge, and it be kept the same width wherever the bed or clump joins the path. The corners or breaks in the outline of the beds suggest good places for

specimen plants and shrubs, which should only be sufficiently removed from the path to secure room for their proper growth. Trees in the centre, or far away from the path, are blemishes ; and if there be no other reason, specimen plants should be seen well without going out of the gravel walk.

On the side of the path next the boundary, breaks may be formed with clumps of roses, or American plants, or even flowers, that the outer border may not be so formal. By a receding of the clump towards the corner, the real boundary may be so concealed that it is impossible to tell whether there are ten yards or ten acres round the corner ; and these contrivances, varied a little, but to the same effect, give an appearance of far greater extent than there really is. It is perfectly immaterial whether this leads to a statue or a seat, though we always prefer the latter ; it is more useful and appropriate than any statue. Small beds or clumps cut in the grass, between the path and the border, help to break the line still more. We need hardly say that the boundary border of shrubs ought to be higher than the fence, whatever that fence may be, because the appearance of a fence or wall completely upsets all attempts to conceal the real extent. The greatest evil that most men fall into is the cutting up of a lawn by planting trees and making beds away from the gravel walk, and this makes us the more desirous to press upon the mind the impropriety of all such work. It may be permitted to put a circular basket occasionally near the mansion, and form beds to imitate baskets of flowers ; but even these should be carefully and sparingly adopted.

A flower garden may be formed as mechanically as you please, of any pattern that a pair of compasses, twirled about twenty ways, will suggest ; but they should always be adopted in isolated places, out of the general landscape—in some favoured nook that we may find.

So far as it can be accomplished, all ugly or formal buildings should be planted out. Greenhouses, and other horticultural buildings, often form no exception ; for they are occasionally great obstructions to a fine bit of landscape.

The road being kept wide, and the borders planted in proportion, the clumps that join the path at intervals on the inside or outside—that is, towards the border or towards the centre of the lawn—must be made large in proportion ; so that, when the shrubs grow up to a reasonable size, the proportion

shall be in accordance with all the rest of the plan. Nothing looks so pimpled and ridiculous as small clumps ; and, except here and there in a favourable position for a few flowers, none ought to be made less than from ten to twenty feet across ; because then you can form a rich clump of shrubs, and have flowering deciduous trees in the centre.

EVERGREENS DESIRABLE.

All pleasure-grounds should be planted with evergreens ; the entire features should be evergreen—as much varied as you please, but still evergreen. Deciduous trees should only be at the back of the others, or surrounded with them, so that in winter time the place should look as well clothed as in summer. It is possible, by these precautions, to make an acre of ground look as if it were part of a large domain instead of a limited space ; whereas, if the path were four feet instead of six, or eight, or even ten, everything would strongly betoken the smaller space. We have seen in an acre of ground, a little cottage, a very small conservatory, a greenhouse of the same diminutive kind, the imitation of a small chapel, stables, picture gallery, rock-work, fountain, and half-a-score other things, all cramped and inconvenient, and every way worthy of children instead of grown persons ; plenty of taste in miniature, but unworthy of anybody of expansive mind, and perfectly unnatural ; whereas, if the contriver, who was so ambitious to imitate everything, had been content to make all his space match some pleasant portion of a larger estate, there had been something to admire and think of afterwards—something that would bear looking at. It is quite possible to adopt some other feature, but nothing should be attempted upon a small scale ; it only destroys the grand features of the landscape. For instance, if there be any appropriate place, there might be rock-work ; or if there be facilities for water, there is nothing to prevent its being done ; but unless it be done upon a large scale, it is labour wasted to spoil the scene.

Straight paths ought under any circumstances to be avoided in the pleasure grounds if the landscape plan be adopted ; and portions of the house should be planted out as well as any ugly object ; that is, the shrubs planted near the house in clumps should be so placed as to break the straight line. If the house happen to be on an eminence, a terrace walk is not

uncommon nor inelegant ; but the planting of the front below it should be so contrived as to hide all the formality, and this can only be done by forming large clumps at appropriate points. The main path, too, should be carried round quite independent of the terrace walk, and removed far enough to allow of planting between them, so as to conceal all the stiff outline of the terrace walk, and keep up the landscape character of the principal lawn and shrubbery.

Of course, every place has its peculiar capabilities and disadvantages, and we must always be guided a little by circumstances ; but the main object, that of making the place appear as large as possible, or, in other words, to make the most of a small space, must be kept in view.

The principle on which landscape gardens is conducted properly is, that which pervades the most beautiful spots in nature. Landscape gardening is the art of imitating as many natural beauties as possible in a garden, and following nature strictly as a teacher ; hence, we have no straight walks, no square-sided canals. But, inasmuch as nature furnishes us with a reason for crooked roads and winding streams, we must take care and imitate the cause of the deviation, as well as the deviation itself. The paths pointed out for us on swampy ground are the highest portions ; the road marked out for us in a mountainous country is round a hill, rather than straight across it. Nature, therefore, always furnishes us with the cause of deviation : we cannot go straight through a forest, nor straight over a mountain ; we cannot, or rather, we will not, go through water while by walking further round it we can keep dry. Water itself winds a devious course, because it will keep to the lowest ground. Pour a jug of water gently on the ground, even where you think it level, and you will soon see that the slightest inequality will cause it to turn aside. In this way have rivers been formed ; and there is hardly anything more picturesque than the winding of a river, where there is also grass and wood to help the scenery. Now, there is nothing here but what can be imitated ; but it is better let alone than attempted on a small scale.

We may be told that we cannot imitate the sturdy oak of a century ; then let it not be attempted : but there is generally timber in the place, or in the neighbourhood ; and the art of planting is so to dispose your own trees as to conceal the boundary where your estate ends and somebody else's begins.

It is the very acme of good management to appropriate the surrounding trees to your own purpose ; that is, make them features in your own landscape. Plant your own as if there were no fence or wall between you and them ; and this, remember, is to be done by a judicious management of the planting at the fence and the clumps that are nearest. In some places barely top the fence by the shrubs, in others get in the very tallest you can find ; have a clump between the lowest and the walk, with shrubs considerably taller than those at the fence. These features are calculated to break the appearance of a boundary, and, by widening the boundary planting considerably in some parts, you again destroy the monotony, and give an appearance of extent.

CHOICE OF SHRUBS, AND PLANTING.—The shrubs used in planting should be chosen rather with regard to the wood around you. If you are surrounded with firs and cedars, let some of your plants be the same ; not the same sorts, but the same family. If the nearest trees are chestnut, or lime, or elm, or any other distinct character, do as much towards imitating it as the nature of your planting will allow. You are not to use all deciduous plants, because they do ; but you may have enough of them as near the boundary as may be. The most effective kind of planting away from the house is to keep each clump distinct as to family ; hollies in one or more, pines and cedars, laurel, bay, each and every interesting family may be provided with its place at the most distant clumps. Nearer the house, the Magnolia tribe, in all its hardy varieties, may form one or more of the conspicuous groups. The various American flowering shrubs may either form dwarf clumps in appropriate places, or foremost objects in the larger ones ; and the border or belt plantation should be a mixture of everything lively and varied. The dark green of the holly and yew will contrast well with the brighter greens of the laurel, or the lighter hues of the *Aucuba japonica*, and other variegated shrubs. Regard, however, must be had to the rate at which the different trees grow, or you may have your front shrubs in a few seasons topping the back ones, and destroying the gracefulness of the groups formed here and there in the border, and spoiling the effect altogether.

The borders and clumps should be all made large enough to leave two feet for the summer additions of flowers, and to accommodate always, at particular distances, a few of the best

flowering dwarf Americans, which show their blooms only in spring, and enliven the scene when it would otherwise be sombre. The *Pyrus japonica*, with its scarlet flowers, begins in the autumn, and continues, if mild, all the winter. The dwarf almond is almost the first to show the approach of spring; and numerous other plants, unimportant in themselves, contribute to the beauty of a well-planted border. The path once laid down, the turves soon carpet the space, and nothing so soon puts a finish on the landscape garden.

We have here only spoken of the most simple style of gardening; we say nothing of water or rock-work, of hill or dale, nor of flower-gardens: all those require separate notice, and will have it; we have merely recommended that, as a summer-house is the first thing everybody thinks of, it should be on a good large scale, in imitation of a temple; that the ground, if it be but an acre, should be laid out in landscape fashion, and that the rules of landscape gardening be observed in every movement;—a formal shrubbery is a frightful object. The botanical garden at White Knights, abounding with noble specimens, is altogether spoiled by its formality; the trees are in straight lines, or parallel beds; and though their different growths have spoiled the uniformity a little, there never was a better proof of the impropriety of straight lines in a garden than that collection of splendid trees and shrubs affords.

EDGINGS.—Of the many subjects that make edgings for beds and borders, the first and foremost is box; for it can be kept neater and cleaner than anything else, and there can be nothing in the vegetable world that is kept so easily within moderate bounds. The formation of box edgings, too, may be accomplished with an exactness that cannot be preserved with any other subject. It may be made an inch above the ground, and half an inch thick, and laid to any figure with the exactness of a line. The whole art of making a good box edging consists in *first* trimming the box, tearing it to pieces not thicker than the line is wanted, cutting the tops square, and adjusting the roots so that they will not go too far down: next, levelling the edge of the bed or border, and treading it hard, putting soil on where it sinks too much, and paring it off where it is too high; having with a rake made the surface smooth, stretch the line tight exactly where the edging is to go; pat it down with the spade, so as to make a mark with

the line : third, you with a smooth spade cut and pat a sloping bank, of which the line mark is the top ; against this sloping bank you place the box, with its square top half an inch above the line mark, and push the loose stuff up against it, to hold it there, and continue it till finished ; you may then put the rest of the stuff close up to a level of the line, and it is ready for the gravel outside. So much for the straight line : when any figures are to be done, the bank must be made in the same way, but you must find other modes of marking it. The next best edging, to our fancy, is *Arabis alba*,—very like white alyssum ; the only difference is, that as this should be planted two or three inches apart, when you have made the line as for box, dibble the single plants of arabis in with an iron-shod dibble. Gentiana, thrift, daisies, perennial candy-tuft, are all used ; but we like the arabis best, because it blooms white, and with abundance of flowers, from February to the beginning of May. If planted in the autumn, it will be three or four inches wide by blooming-time, and its glaucous leaves are lively all the winter. It should be replanted every second year, or it gets too wide. We have more than once or twice, in various papers, strongly recommended the glass-bottle-makers to get up an edging of the same coarse glass that wine bottles are made of ; but hitherto without effect, although we published simple patterns, that they might get moulds for easily. It would be far better for the flowers than even a box edging would be, for it would not harbour the slugs, snails, and other vermin, as box, and indeed everything else does, where there is any place to conceal them. Vitrified ware, nearly the form of bricks, have been used with advantage ; but they are unsightly, and, not being mechanically true, they cannot be set in a correct line, nor worked with certainty to any given figure.

THE FLOWER GARDEN.

Geometrical or Dutch gardens are very beautiful, when made in appropriate places, and upon good principles ; but the diversity of form is endless, and there is hardly a prettier feature in a garden establishment, if it be well managed. They ought to be formed with gravel walks and beds, and the designs should be very different to those flower-gardens which are formed by cutting particular figures in grass, though both

should be done in such uniform figures as to make up a pretty whole. In marking the garden for gravel walks, the figure must be so managed as that the gravel walks shall be of equal width all through the figure ; whereas in grass borders, which allow much more intermediate space, there is no need of confining the portion between the beds in any way. In fact, the portions to walk on may be of a particular figure, as well as the beds themselves ; but there should, nevertheless, be a complete uniformity throughout, because when the eye rests on anything manifestly artificial, it should always be in order and regularity.

GEOMETRICAL GARDENS.—It may, however, be said, that pieces of ground generally selected out of the general landscape—that is to say, in a recess of some kind, or a nook of the garden—are not always of a uniform figure ; and in such case, the figure cannot be made uniform ; but where such is the case, a square, or oblong, or circle, must be taken as large as the ground will admit, to contain the figure, and the remainder laid out independently, without spoiling the figure. For instance, say the plot of ground is neither round, square, nor any regular figure whatever, begin by making a positive geometrical figure, as large as it will allow, and let the outer path be made first ; all that is outside the path may be planted with shrubs, or made into a rosary, with dwarf plants nearest the path, and all behind gradually rising ; or it may, if there be much of it, be put into grass. The inner portion, or figure, whether it be square, round, oblong, or triangle, is then to be laid out. We confess that, to us, there is nothing so effective as a circle ; it admits of endless variety, and you may form a hundred designs, if you only play with a pair of compasses, as a boy does when he makes stars for his kite. Set your compasses with a double line, so that they form the path ; get some paper ruled with lines to form squares of an eighth of an inch, and set the double point of your compasses to that width, and reckon this eighth of an inch either two feet or three feet, whichever you intend your paths to be ; set your compasses so that you take in the exact size you intend the ground to be occupied ; first draw your circle, but as the outer path is to be any width you please, make proper allowance for it. Having made your circle, without altering your compasses, stick the point on the outer line, and make the double point commence at one side, and draw it over to the

outer edge on the other side ; put the point in again on the outer line, where the other left off, and continue to do this until you have perfected the figure, as far as it can be perfected, by putting the point of the compasses into the marks where the other or moving points come home. If the point is now put exactly half way, and another series of circles or portions similar to those already made are worked out, the divisions will be more numerous, and the shapes may be more diversified. But, in order to get a greater variety of forms, and to get some practice, it is better, perhaps, to use the single points only, and, without altering the compasses at all, make a circle ; then with the point on the line draw a second ; place the point on the line of the first circle where the second crosses it, and make a third ; the point where this crosses make a fourth ; and keep on until six circles round the first complete a figure. By commencing another series with the point half way between the points used for the six, you make twelve. The whole circles being filled with squares already ruled, you will be able to mark out beds of the most extraordinary shapes, but perfectly uniform. These may be still more diversified by drawing from the centre point one circle half-way between the line of the first circle and the centre point, by altering the compasses to half the width.

A man inclined to form plans for flower gardens will derive infinite amusement from the numerous forms that can be made with geometrical precision by merely playing with a pair of compasses. When we come to reduce this to actual practice, the compasses must have a double point for the paths, for these must be of one uniform breadth all through the bed, and in no case should the width come double. Those, however, who have not the double point, may produce the necessary lines by opening the compasses as much as the path is to occupy.

It would be scarcely worth while to give examples, because the instant any working man begins with the compasses, he will see there is no difficulty in producing endless variety.

The plans of beds to be cut on grass merely require that the portions to be planted should be wider apart ; grass must not be too narrow ; the grass must form the carpet, and the beds the pattern ; taste, with the aid of ruled paper and the compasses, will suggest a thousand modes to please the eye.

FURNISHING THE BEDS.—But when the garden is made,

there is much to be considered in the planting. Not one flower garden in a hundred is ever decently filled ; uniformity and symmetry are lost sight of in the endeavour to use as many kinds of flowers as possible ; and not one have we seen that has not been spoiled by the mode of planting. Generally speaking, it is desirable to have twenty-four beds—three, or six, or twelve, of one form, besides a centre one—though to see one of these geometrical gardens in perfection, the centre should be gravel, that the proper effect may be seen from the middle, whereas a centre bed deprives us of this view. If, as is usual, there be six beds of a form, it is throwing all the advantage away to aim at too many colours. Every alternate bed may be of one subject, which, being uniform, gives a good effect ; but we prefer all six alike. Another six may be all alike, and of another colour. So also may be a third and a fourth six. Annuals are great favourites in geometrical gardens, but there is nothing comes up to the verbena for length and steadiness of bloom, unless it is the scarlet geranium. Let the outside of the figure be planted with anything you please, but have the figure itself planted with subjects that require no changing. The more intricate the figure, the more the necessity for dwarf plants and for permanent subjects. Those beds which form the outside circles cannot be better planted than with various scarlet geraniums ; they are striking and lasting. The diversity of colours in the verbena, and the exceedingly dwarf habit of the creeping varieties, afford great facilities for completing the inner beds—there are purple, white, pink, lilac, salmon colour, crimson, and indeed almost every shade but yellow may be secured from May until the frost cuts them off. The only colour we seem to want is yellow, and these are for the most part temporary. Calceolarias are the best subjects.

If, however, changes are to be made, we have abundance of colours among the annuals and perennials of other kinds, so that we need not cross our fancy for colours. The *nemophilas*, *convolvulus*, and *Lupinus nanus*, give us blue ; the *eschscholtzia* and *erysimums*, orange ; the *mimulus* and yellow pansies are bright and beautiful ; but to see a geometrical garden stuffed with *heliotropes*, which are nothing to look at, or *mignonette*, or any of the usual straggling and ineffective subjects, is aggravating to every man of taste.

Everything in one of these flower gardens should be striking

and dwarf ; they must never overrun the box edging, because the figure is at once destroyed. There is a vast difference between the management of these and mere clumps on lawns or beds in any other place. It is of the highest consequence to keep everything within the figure, wherever that figure is valued.

FORMATION OF GEOMETRICAL GARDENS.—The formation of these gardens on paper, in the manner we have hinted, renders it very easy on the ground, because it will occur to any practical man that by placing a stake on the spot where the point of the compasses are placed on the paper, a cord doubled and tied the exact length you want will be your compasses ; put one end of the loop over the stake, and put a stick to the other end, and you may mark your circle as well on the ground as your compasses do on the paper. You therefore dig and trench the whole plot, level it and roll it to an even surface, then mark it by means of your line and stakes until you have your figure on the ground ; when you have all your marks made, rub out with the foot all those you do not intend to use ; leave none but your beds and the paths between them to divide your attention. You then commence operations by throwing out the earth a spit deep along the middle of your paths to make room for chopping the sides down like a bank, carefully pressing the back of the spade in a sloping direction, so as to make the beds all perfect and standing in relief ; the earth you have thrown out of the paths is as well on the beds as anywhere. This being all perfected, and the loose earth chopped from the sides being in the path, trim all your box of a length, with the tops cut square, and thin it out almost into single stems ; the box when planted ought not to be more than an inch wide in any part, and unless it be torn into small plants, you cannot manage to make it even. The surface of the ground being perfectly level when you begin, and the earth thrown on to the beds lying on the middle, and not interrupting the line of plan, take your box in sufficient quantity, and lay it against the bank you have formed, with the tops just half an inch above the surface, and this being cut square can be so well adjusted that when finished it will be as level and even in thickness as it can be made. As you lay it, bring the loose earth in the path up against it to hold it in its place, forming a bank outside it to keep it firm. We need hardly say that if this be all properly done the figures

will be perfect, and the box all alike the whole length. You have then only to wheel the gravel in, and, with a narrow roller, press it into its place without disturbing the box, the figure of which, if kept properly preserved, will last unimpaired many years.

The principal points to attend to are—first, to roll all the ground smooth, and see that it is level; next, so mark your figure as that you can see well what you are about, putting out those marks which are mere surplusage,—that is, not wanted; all the marks that cross the walks and confuse the figure, but which, nevertheless, like the crosses and marks on the paper, come on the development of the figure,—so as to leave the figure perfect and easy to decipher. Then clear out a good spit deep all the centres of the paths, and throw the stuff on the centre of the beds if they are large; but if they are numerous and small, it may be necessary to get rid of it by wheeling it away altogether; generally, however, the beds are large enough to take it, and only rise a little for it in the middle.

We have said nothing here about draining, because we presume upon that having been performed on every part of the garden before you commence. The chopping out of the figure is rendered very simple and easy, by removing the earth from the middle of the paths; but there is some ingenuity in pressing the soil of the sloping bank you form, so as to make it firm. Gardeners who are used to the work press the back of the spade against the part they leave, at the same time that they take the other away; on the correctness with which you attend to the lines of the figure depends the entire beauty of the flower garden up to the planting, which if ill-managed, will destroy the best figure in the world, or at least mar the effect.

It is necessary, first, to choose dwarf subjects that bloom as close to the ground as possible; secondly, to put the colours in uniform,—that is, if six equal beds are round a centre, only to attempt two colours or two mixtures, one each for the alternate beds; then three scarlets at triangles, and three purples, yellows, whites, or blues at the points of the other triangle. Some would think they met all the necessary uniformity by three different colours, one opposite the other, but the magic of a well-balanced geometrical figure is destroyed at once, as will be seen in an instant by trying it on paper. Thirdly, for the sake of saving trouble, use such subjects as

will not require changing; for though we admit there is a charm in change, it is very difficult to manage it without losing bloom for a considerable time, or occupying many hundreds, if not thousands of pots to bring on things that may be got to bloom for such changes.

THE POT-GROWING SYSTEM.—It is possible to manage thus for a succession of bloom with abundance of trouble and means. See how many pots will fill all the beds at six inches apart, and that the earliest advantage may be taken of the opening spring, let so many pots be used for spring bulbs, three colours of crocuses, yellow, blue, and white; the same of hyacinths, confining the latter to the dwarf kinds; then there are snowdrops, *Scilla sibirica*, and the dwarf daffodil; these latter are even before the crocuses. The pots of everything should be one size, what is called large sixty, or four inches at top but much smaller at bottom. To follow these, which will last from February till May, the verbenas in every variety may be brought forward; but there is a choice of fifty things that may be in bloom in May. The beauty of this pot system is, that all the pots being of one size, they have merely to be lifted out when done blooming, and those in flower dropped into the same holes. An hour, with proper assistance, would do thousands of pots, and the whole face would be changed before breakfast any morning, and the old pots wheeled away. Generally speaking, flower gardens are not made up till May, and then there is abundant choice.

In very small places, always in sight, the pot supply is good; and it is carried out with great advantage in villa gardens, where everybody who passes can see the place.

There is but little taste exhibited in bedding out plants generally. Those subjects which belong only to the backs of wide borders are frequently thrust into pretty small clumps, the form of which is destroyed before the plants are half grown. Tall fuchsias, salvias, and other similar tall plants are totally unfitted for any given figure; they are only fit to be placed in the background. If they are to grace a clump, it should be on a large scale, and without any particular outline or figure.

The prettiest way of showing off anything ennobling or tall, is in clumps with basket or rustic borders, that they may appear like baskets set on the lawn. Roses look better so than any other way; and if the basket border be well

adapted, there is hardly a prettier device. Heliotropes, mignonette, violets, and aromatic plants generally, which are really wanted for their perfume, and are nothing to look at, should be always placed in the nooks and corners. They form no feature in flower-beds, and the perfume is quite as pleasant when they are not seen as when they are.

FLOWER BEDS ON LAWNS.—There may, however, be great liberties taken with isolated beds cut on lawns; it is only when they form part of a figure that we are bound under any circumstance to preserve that figure, and more particularly if it be at all dependent on angles or intricate windings. Many consider the figures cut in grass to be superior in effect to those formed with gravel paths and box: we do not. Grass is such a finish in itself when well kept, that we would not consent for a moment to impair the expense of the centre by cutting up any part of it for flowers. If there needs must be flowers on grass, let the beds be at the side parallel with the main path; let there be a verge of green a foot wide; the bed cut close up to that, and whatever diversity of figure may be required, let it be inside. Vary the figure as much as you please inwardly, so that it reach a mere verge of grass next the path; but to cut a lawn into holes, beds, clumps, or whatever else you may call them, is to destroy the beautiful expanse which is the very charm of a lawn. Nevertheless, it is the whim and fancy of some to cut even geometrical figures in grass, and although we have an insuperable objection, there are some points to attend to where it must be done, to make it even tolerable. For instance, as the flower-beds are useless unless they are attractive, visitors always frequent their vicinity, and if there be not ample room, the grass is soon destroyed by merely walking over the same spot repeatedly. On this account the beds must always be smaller in proportion than they are on gravel, where a path may be trampled on from morning till night, any day in the year, without damage; but if the grass be ever so expansive in proportion to the beds, it is soon damaged if there be many visitors. This is our grand objection; for when grass is worn a little it cannot be brought up again without prohibiting a footstep altogether, or laying down fresh turf, and either of these done at the very season a place is most frequented, is a serious objection.

It is not uncommon to see figures cut in the grass on both

sides of a long straight walk ; we have instances of it in the Horticultural Gardens at Chiswick, and the Royal Gardens at Kew—in both cases, as we think, in bad taste. However, it is one of the penalties we pay for straight walks ; whoever adopts a straight walk as a feature finds something is required to take off the monotony and divert the eye, and this leads to something perfectly obnoxious to good taste. There is nothing elevated in the detail, because there is a common mechanical notion in the path itself. There may be mathematical precision, but there is no grace in a straight road ; and the form of clumps or flower-beds on the sides of the straight road is necessarily mechanical also, and subject to everybody's objection ; for if once we descend to mere frivolity and make uniform half-moons, or horseshoes, or diamonds, or circles on each side of a straight path, we might just as well have a row of posts, and chains hung on festoons for the children to swing upon. If a piece of lawn is to be devoted to a flower garden, and the geometrical figure is to be adopted, let it be so made that the eye may look down upon it from an eminence. Rosherville Gardens afforded this opportunity. There is nothing in the figure but what the compasses and a ruler would accomplish ; and what will they not ? But when the fancy beds were nearly filled and in bloom, we could look down from the chalky heights and fancy the lawn a green carpet and the beds a gaudy pattern, standing up in bold relief. But, as we have already said, the grass must form the principal quantity, and contain a space large enough to prevent wearing in any one track.

The figures necessary for grass are as easily contrived as those intended for gravel walks. The identical figure with its thousand circles, and crosses, and angles, that will give us fifty varieties of form for a Dutch garden with gravel walks, will give equally as many for a grass carpet. To look at one of these practice papers, as we may call them, is like pleasing one's fancy in a coal fire. We may fancy a thousand forms by looking on one, two, or more of the minute divisions, in what shape you please, and these are sure comparisons. There is not a division nor half a dozen joined to make a form, but five more can be found to match it. We feel more than half inclined to give an instance of a paper scratched all over with circles of different sizes on a groundwork of squares ; it would give an idea of the diversity to be worked

out ; but it is so simple an operation to provide it, that it would almost imply a deficiency of intellect to publish one, and we would rather have the young gardener try.

But it may be said that everybody does not like a figure formed within a given square or circle ; that the ground may be more favourable for an oblong : granted,—then work your figure with two circles, and it will be twice as long as it is wide, or a circle and a half, which will make an oblong not so divided ; but you must mark out the ground you intend to lay out, and always keep your eye upon uniformity. Draw circles without number from various points, only keep up uniformity,—that is, if you place the point of your compasses on a spot nearer one side or end than the other, do the same on the other side or end, that there may be corresponding circles. The ruled paper, be it remembered, already gives you the advantage of paths crossing in various directions, and saves many speculative rulings during the process of designing.

In the transfer of any design from the paper to the ground, you have only to remember that the stake placed firm on any part of the bed or figure forms the equivalent to one point of your compass, and the loop of any dimensions you please put over it, and the point you mark with the other end of the loop, is the working point of your compass ; the shortening or lengthening of the loop opens or closes your compass, while the squares on your paper enable you to do everything by scale ; the eighth of an inch may be the representative of one foot, two feet, or three feet ; you cannot go wrong.

With these remarks, and a few evenings' practice with the rule and compasses, you will produce an endless variety of plans, all tending to illustrate the beauties of geometrical gardening. But they must be made in places which do not interfere with the general features of the establishment. If there be no natural recess or nook calculated for the place, you must take the most eligible, and plant it out as if it did not belong to the concern. It is not generally desirable to make a place smaller, but better anything than introduce formality in a landscape. It is not difficult to shut out a space. It is true that the first year, and before the shrubs have a little growth upon them, the design will be seen through, but as soon as the planting fills up a little, the object is concealed. The most desirable place perhaps is a corner, and that because

the concealment is not so conspicuous. By bringing out a belt of shrubs far enough to enclose the necessary space, you may either conceal the entrance, by planting one belt to overlap the other, or by erecting a small temple or covered seat as an object in the landscape. The flower garden may be placed at the back. Flower gardens, straight walks, terraces, statues, and all manner of architectural contrivances, may be made in front or at the back of greenhouses, conservatories, or other ornamental buildings, and beds laid out in appropriate style. The plan of the buildings will suggest the most eligible plan for the garden, but whatever is formal should be planted out from the general landscape, even when the formality is forced upon us.

TERRACES are raised walks; they belong to the formal style of gardening, and are generally next or near the mansion. The architect has more to do with these than the gardener, who has merely to shape his work to the adjoining subjects. Terraces may be formed in different parts of the garden, and particularly on the side of a hill, or in front of a conservatory; certainly it does not belong to a landscape style of gardening. There are some noble examples at the Crystal Palace, in comparison with which most others would look poor. Terraces are generally ornamented with balconies, statues, and vases. It is not uncommon to have fountains at each end of a terrace, and there is usually a double flight of steps in the centre, or one flight at the extremities; the principal care of the gardener, then, is to keep his vases full of choice blooming plants.

ROSARIES.—Apart from the general instructions on the treatment of the Rose, it is now made such a distinguishing feature in all well-appointed gardens, that it may be worth considering how it can be best displayed to advantage. The most simple and effective way that we know of is three or four rows on each side of a path, standards, half standards, and dwarf, each row a foot lower or higher than the next; say the front row is dwarf, the second worked one foot high, the third at two feet, the fourth three feet, and, if another, the fifth four feet. When we say worked a foot high, it must be remembered that the dwarfs, though only a foot from the ground to the top, hide the foot stems of the next row, and the heads of these hide the stems of the third, for the heads may be well calculated at one foot: when the whole are in

flower it is a bank of Roses ; and we have never seen, among all the rose gardens and rosaries in the country, anything more effective. We have seen scores of elaborately worked arches, pillars, and fancy frames on which to grow roses, from the gigantic circular ironwork like a gasometer frame, at the Crystal Palace to the doorway of a summer house, but never saw anything half so effective as a ten-foot border of roses, whose heads nearly touched each other, and formed, as it were, a solid bank of that beautiful family, in endless variety and full bloom, and this on the left hand as well as the right. There are plants that require ornament, plants whose merit is in the form they can be made to assume ; but the Rose is one of the plants which is perfect in itself ; it is profanation to make it look artificial ; if it be a climber, let it go up a wall, or a cottage front, or over some inartificial, rudely constructed supports, and cover an avenue ; but it certainly never looks so bad, so out of place, as when constrained to help hide a mechanical arch, or stick up like a pole. Let it cling to the trunk of a tree, or trail on the ground, but save it, oh, save it from being bound hand and foot to the iron birdcage, or the wiry sides of a cockney rosary. No matter how the rose is disposed of, in beds, borders, grass plots, or on walls, on the house front, or the gate-post, or climbing the roof of a thatched cottage, it is a gem, and needs no ornamental nor mechanical assistance. All we shall impress on the mind of the rose-grower is, to buy none but continuous blooming varieties ; have a dozen of a sort rather than admit such as bloom a month, and cumber the garden eleven months without showing a flower ; go to a good man, tell him what you want, and take what he recommends ; put the responsibility of a continuous bloom upon him, and tell him you would sooner have a score of one sort than see the head of his rose-trees without a bloom.

AMERICAN GARDENS. — Those plants which are called American, many of them very improperly, grow best in peat earth, and although a good deal may be done for them by surrounding each with a spade full or two, they will only do well until the roots get through it. The first symptoms of decline are weak shoots, little bloom, and slow growth ; in time the ends of the leaves appear as if they were burned, many fall off, the plant gets bare, and they merely exist, or perhaps not that. Rhododendrons, azaleas, andromedas,

kalmias, and such like, should have a bed to themselves, and that bed should be peat. The bed ought to be dug out eighteen inches deep, and filled with turfy peat, chopped up tolerably small. The plants should then be placed at proper distances, allowing them room to grow, keeping the collar of the root as high as it had been in its former place of growth. They require moisture, and this must be given with the watering pot. When their flower buds begin to swell they must never be dry, and after the blooms have begun to decay, and the plants begun to grow, they must be copiously supplied until their growth is complete and flower buds are formed. They may then be considered at rest, and water may be withheld, unless the weather proves extremely dry. Generally, however, they may be left to the weather, which will supply them well enough. In forming American beds we must avoid the unnatural fashion of heaping up the soil into a mound; the soil should in no part be raised higher than the verge, and were it not for the appearance the plants would do better if it were considerably lower, because water would then remain and soak where it fell, but if the ground rises in the middle the plants on the highest part lose a good deal, while the side plants get more than their share. All these plants will, if not well supplied with water while making their growth, fall short of completing it, and not form their terminal bloom bud, and it is very common for them to fail alternate years. They will flower abundantly one year, and this so delays the after growth that they have hardly time to complete it before the cold weather pinches them. The next year, as there is no bloom, the growth commences earlier, and they complete it all over. However, this want of flower may be prevented by removing the decaying blooms down to the buds below, for the swelling of the pods of seed delays the growth, whereas by removing them as soon as they fade the buds push directly, and if the plants are kept moist they will make all their growth and set their buds before the cold weather affects them at all.

NURSERY GARDENS.—Nurseries are departments in which trees and shrubs are raised to make and mend plantations and keep up the timber of large estates. In these departments tree-seeds, nuts, and berries of all sorts are sown, and when the plants are large enough they are put out in nursery rows. In time they want to be removed to give them more room,

and when arrived at the stage in which they may be planted, they are drawn as they are wanted. Here also they keep stocks of those plants which are raised by layering, bud and graft stocks, with the more valuable species, the different families, whether fruit trees, shrubs, or ornamental timber. The public nurseries are those where all these things are done for sale, but the different establishments give most room to things for which the owners have become noted, as Rivers, of Sawbridgeworth, and Lane, of Berkhamsted, for fruit trees and roses in pots and open ground; Chater, of Saffron Waldon, and Bircham, of Bungay, for Hollyhocks; Low, of Clapton, and Rollisson, of Tooting, for Orchids and stove-plants; Pince, of Exeter, and Jackson, of Kingston, for Heaths and Camellias; Dobson and Son, of Isleworth, for Geraniums and Cinerarias; Holland, of Middleton, for florists' flowers; Holmes, of Hackney and the Versailles Nursery, for Chrysanthemums; Harrison, of Darlington, Barnes, of Stowmarket, and Salter, of Hammersmith, for Dahlias; and others, who, taking pains to push particular branches of the trade, give more attention to it, and perhaps serve the other members of the trade. But all these that we have mentioned are general nurserymen, and execute orders for everything in the nursery trade. The business in the nursery trade goes on just the same as in private nursery gardens, only that as hundreds are operated upon at a commercial nursery, where not half-a-dozen may be done in a gentleman's garden, there is more system, a greater division of labour, and many additional facilities required. As to the management of a nursery garden, there is nothing more than will be found in reading the various directions for the propagation and cultivation of the subjects in private establishments. A volume devoted to the subject would only be repetitions of instructions to amateurs and gardeners. No two nurseries are laid out alike; nothing is attempted but straight lines, parallel beds, plants at the same distances as other people have, and a larger quantity.

WINTER-FURNISHING FLOWER BEDS.

Perhaps there is nothing more common in the very best establishments than to see the flower gardens pretty nearly abandoned to their fate after the first destructive frost. If the families are present, the dead plants may be cleared

away, and the space left for weeds until the time comes round for filling them again; but there is nothing more easy to avoid than this appearance of desolation, nor, indeed, is there any period of the year when there is so much need of doing all that can be done for the sake of neatness. At no period of the season ought the flower beds and borders to be unfurnished for a week together; once set a gardener up, with the means, and he will be unworthy of his place if he do not keep them up himself. We admit, that when the annuals die off, however well the garden may have been furnished before, there is a miserable paucity of flowers; the close as it were of autumn locks up the pride of the gardener, for one day all his beds and borders may be brilliant with flowers, and the next, all black with rotting foliage and stems. The miserable plight in which everything appears, the seeming hopelessness of doing anything to make the place cheerful, the utter dreariness of the flower garden and borders, look which way he will, may be enough to dishearten some men and to damp the ardour of all. What then is to be done?

First and foremost, set every hand in the place clearing away the wrecks of flowers and plants; let nothing like decay be found in any single spot. Of course, this pretty nearly empties the flower beds that are appropriated to annuals. Some people plant an odd shrub in the centre of each, as a kind of fixture; many will have a rose in every clump or bed; but let us imagine the beautiful geometrical figure which blazed with half-a-dozen colours yesterday, desolate and empty to-day. Let whatever number is uniform be planted at once with potted dwarf evergreens, raised and kept in pots for that purpose. Let a large share—that is to say, the most conspicuous beds in the figure—be studded with *laurustinus*, which supply flowers as well as foliage. Let another uniform set of beds in the figure be set with dwarf dark green *Arboretæ*; as a third set may be planted with variegated holly; a fourth with *Aucuba japonica*; a fifth with *Berberis Aquifolium*; a sixth, if there be so many, with small firs, and of these there is such endless variety, that other sets of beds might be furnished with different sorts, varied in form and colour. By mentioning the number that is uniform, we mean this:—if the figure consists of twenty-four beds in geometrical order, forming a circle, and radiating, as it were, from the

centre, there may be six beds of one form, six of another, six of a third, and six of a fourth ; or as the circle enlarges, the outer beds may be divided into twelve. What we mean by the uniform number is, that if there were six of a like shape round the centre, three of them should be planted alike, and then the alternate three, or that all six should be planted alike, because uniformity must be kept up, or the whole charm of a geometrical garden is destroyed. A single day would suffice, with proper help, to dress out this garden with evergreens, grown dwarf in pots for the purpose, and planted at convenient distances, not crowded, for they would not look so well. We need hardly lay down any other rule than to choose such as have different coloured foliage, so as to contrast the beds as well as possible. The flower garden judiciously planted in this way, as soon as the frost destroys the flowers, looks as highly finished and as neat as when it is covered with bloom, although certainly not quite so gay.

All the beds on a lawn should be served much in the same way. All the conspicuous parts of the *parterre*, which would look very ill when empty, may be thus made to contribute in winter to the warmth and comfort of a place in appearance, as the flowers do in summer ; for it cannot be denied that there is a coldness and dreariness in empty beds and clumps which nothing can compensate for. These dwarf shrubs should be plunged in pots for the convenience of quickly changing them again for something else. All the bare places near the house and in the dressed ground should undergo the metamorphosis of winter-dressing, and the *laurustinus* must always form a conspicuous figure, because it is in flower all the autumn and winter. In arranging the height of the various shrubs, those farthest from the centre should be the highest, if there be a difference, but they cannot be too low. If bushy little plants, of one foot at the most, could be had, wherever there is a figure to preserve, it should be restricted to that if possible ; anything taller conceals the figure, and takes from the geometrical plan more than half its beauty. The variation of foliage has the most pleasing effect. The box, both the green and the variegated, can be kept for years from getting too large, because it bears pruning to anything, and grows closer and better for it, and pot culture will stint the holly, and almost every description of evergreen.

Gentlemen who take a pride in the winter-dressing of the

garden, should furnish their gardeners with some hundreds of these potted evergreens from a nursery; they may be had reasonably at any time of the year—*Arborvitæ*, red cedar, six-inch firs, hollies, berberies, striped *alaternus*, yews, *laurustinus*, box, green and variegated—any, or all may be had, but they must be planted uniformly, that the figure may be always correctly balanced, as it were, and complete order preserved.

In borders, and large beds not uniform, the shrubs may be larger, and they may be mixed without offending the eye, because there is no order to preserve; but if there be many beds, they will look better with different coloured foliage from one another, but all of a sort in the bed; this gives a much better contrast than mixing them; but if a bed stand by itself, the mixture is desirable. Of course there must be plants of different sizes, and the pots must be adapted to the plants, and the mode of keeping them and pruning them must be regularly attended to. As stunted growth, so that it be healthy, is desirable in these plants, and as they make their growth about the time they are removed from the beds, let those that will bear it be pruned in close before they make their shoots at all, for when the new growth is made on the tree or shrub it is too late. Of course, the firs, cedars, and *Arborvitæ*s will not bear the knife; but when small and potted, they do not make much growth, and therefore may do several years before they grow too large. All the summer months these potted plants should be plunged in a bed not too much exposed to the sun, and some attention must be paid to the watering in the absence of rain, and when they are large enough to fill the pots they will actually require watering even in wet weather.

We have hitherto only mentioned the cheapest description of plants, but there might be plants of *Andromeda floribunda* introduced to some of the smaller beds that would not require too many, and they look very chaste and beautiful the whole winter: their dark green foliage contrasting well with their branching spikes of pearly bloom, which look ornamental from the time they set their buds until they are out of flower again.

This almost leads us to the general system of pot culture for geometrical gardens, which plan is a little more troublesome, but far superior to any other for gardens of this class, and all ornamental and fancy beds, on account of the great

facilities it affords for changing things as soon as they are shabby. The cultivation of all sorts of flowers in uniform sized pots, enables one to take up the set done with, and drop those coming into their prime into the same holes in a very short time, and to effect constant changes. For instance, how early may we have stocks of all colours—pansies, wall-flowers, and the various kinds of annuals ready to take the places of the winter evergreens; and it is worthy of consideration, that only one sort need be removed from their uniform beds to give place to any one sort of flowers that may be ready; and when something else is in proper condition, another sort may be removed from their uniform beds, so that through all the changes their order and uniformity may be preserved. The grand object is to keep all the beds dressed with evergreens in winter.

FLOWERS FOR POT CULTURE TO FURNISH BEDS.—Of the flowers that can be forwarded in pots, there are none better than ten-week and intermediate stocks, mignonette, *Nemophila insignis*, and varieties, double wall-flowers, both the golden yellow and the blood-colour, two or three sorts of dwarf lupine, *Erysimum Peroffskianum*, *convolvulus minor*, *eschscholtzia*, and several other annuals that may be sown in the autumn and kept in frames, so that in very early spring they will come in flower: all these should be grown in the large forty-eight sized pots, those with wide mouths and taper or narrow bottoms, because these lift out of the ground so much better than upright ones, without disturbing the ground, and others with plants already blooming will drop into their places almost without deranging even the surface of the bed. Flowers grown in pots have a more stunted growth and more abundant bloom, although they are somewhat short-lived as compared with seeds sown in the ground; but if it be desirable to keep a place always well furnished, there is no other way of doing it properly with so much ease.

There is no reason why the verbena, scarlet and fancy geranium, and other bedding-out plants should not be forwarded so as to bloom early in May, when they may be turned out, although frosts in May have made gardeners very shy of too early a turn out. Annuals that have been kept in cold frames will stand a little frost, but geraniums and verbenas are more susceptible of damage.

One of the best and most useful perennials to be kept in

pots during the winter to furnish flower beds early in spring, is the pansy, which will flower in March and April, and may be very early turned out, for the frost hardly interrupts its flower, and injures only those which are open. If these be used to furnish uniform flower beds, there may be a great command of colours,—white, blue, and yellow, in perfection, may be supplied by slips, and there should **not** be two colours in one bed, or one range of beds. If there be six beds, every second one may be blue, and alternate yellow, the white may go into other uniform beds, and there may be beds made of those varieties which have white or yellow ground, and dark borders or markings.

Another source of great variety and early blooming may be found in bulbs, which are admirably adapted to pot culture—the beautiful *Scilla sibirica*, blooming as early as the snow-drop, and of the splendid bright blue almost peculiar to itself, should be grown half-a-dozen in a pot; snowdrops the same; then come hyacinths, crocuses, early tulips, and some of the tuberous irises will be found as useful as bulbs. All these are forwarded a good deal by frame culture, and come in at seasons which will enable us to command two or three months flowering, those in frames and greenhouses arriving in six weeks before those in the open ground, and they may even be retarded beyond this.

It forms almost the study of an apprenticeship to take advantage of all the opportunities afforded by pot culture for the furnishing of beds and borders, and there must be a quantity of glass for all the early subjects. But it is not merely the early ones that want pot culture, all the common annuals that would be sown in the borders have to be grown in pots, but without protection, for the sake of working changes during the summer, and removing things directly they are past their prime and begin to look shabby and untidy. The advantage of lifting one set of pots and dropping another set into their places may be imagined, but cannot be fully appreciated without actual practice; but once fairly past the spring months, the verbena and geranium furnish us with a very lasting season of flowers, scarcely lessening in quantity until the frost cuts them off, which in some seasons is not until a late period.

Roses also form an endless source of bloom, particularly a variety which we consider the first and best of all the China

kinds, the Noisette Fellenburg, blooming in June, continuing all the summer and autumn ; and although the autumnal frost will sometimes destroy the flowers that are fully developed, it does not kill the buds ; and we have known a very close approach to Christmas to exhibit this beautiful variety in full splendour. It is worthy of notice, that so persevering does it seem in growth and blooming, that when the severe frost comes to cut everything down, the Noisette Fellenburg rose is cut off with hundreds of buds and flowers upon it. We have never grown it in a house or under protection, but we should expect that it would continue to grow and bloom the entire winter. We have in vain searched among the roses for any one so constant ; the old China and the crimson China are the nearest to it in that particular, but both are inferior in every respect. There are some dwarf varieties which are pretty constantly in bloom ; and we have done much towards keeping up the flowering of beds by the assistance of roses, for it is only by the severe frosts that they are cut off, and then is the time to remove them and put other subjects in their places.

In villa gardens, where the space in sight is limited, we must resort to pot culture for the beds and borders, if we desire a constant succession of bloom ; for plant here as we will, and sow as we please, a great many periods will occur when there is hardly a flower to be seen, or we must so increase the number of species that there can be only two or three of a kind ; and though we should never be without flowers, we should never have much of a kind. The principal care required while the pots are out of doors, but preparing as it were for use, is as respects the watering, for they soon dry ; and with all our care things are stunted quite enough in pots without any starving for want of moisture. The watering, however, is easily enough managed where the pots are kept well together ; and when the plants of any one sort are coming into flower, it is time to look to the beds and borders, to see what looks the most untidy, for not a day should be lost with anything in its prime ; it should be at once put in the most conspicuous places, and something of less consequence removed. The diversity of colour is the great charm of a flower-garden ; and if the place occupied by a yellow to-day is furnished with scarlet or blue to-morrow, it makes it almost like another garden.

Among American plants, rhododendrons, azaleas, and kalmias, all of which may be got to bloom at from six to twelve inches high in pots, are most beautiful, and so varied in colour and habit that they are of the greatest service in beds and borders; and although, in the larger space of lawn and ornamental ground, there may be clumps devoted to groups of these objects, dwarf plants in pots may be used to precede or succeed other objects not less beautiful in their prime.

In the beds of a large garden, and in borders which are kept up with a variety of flowers, there may be a good deal done with perennials; but they must not be planted close enough to prevent the frequent changes and introductions of more temporary, but often more beautiful plants.

In places where the rose is to constitute a feature, regard must be had to those varieties which are the most permanent and constant in their bloom, and which, like the old China and the Fellenburg, already mentioned, will keep up a succession of flowering all the season; for a rose-tree without flowers is no very attractive object; and all those summer kinds which bloom in June or July, and then cease, should be avoided. The cultivation of roses in pots, to exhibit, has become quite the rage; and there is no good reason why they should not be cultivated in pots to furnish the more conspicuous parts of a garden from time to time, when they are in good order, and other floral subjects fail.

Plants grown in pots to furnish miscellaneous borders need not be confined to height nor size. Any bold, striking object that can be made to occupy a conspicuous place, while in good order, and be removed when done flowering to make room for another, cannot fail to render the border more attractive, and therefore are we favourable to pot culture for flower gardens, beds, and borders.

FLOWER BORDERS.—The management of borders upon a large scale requires a few remarks, inasmuch as many establishments have borders all along the approaches to the mansion, or round the boundary plantation. All borders upon an extensive scale must depend for their general appearance on perennials, and these, chiefly, the hardy ones; and it wants some care in the choice, and some little ingenuity in the planting, to manage them, without immense labour, and yet keep up as much inflorescence as possible. The width of

such a border, which reaches perhaps many hundred yards, must be several feet, the back of it being a plantation of shrubs ; and here, generally, some aid must be had from a good choice of these. Flowering shrubs should be liberally supplied in a border of this kind, and even the trees ought to consist of almond, double-flowering cherries, syringas, gueldres roses, laburnums, acacias in variety, especially the rose and white, scarlet horse-chestnuts, mountain ash, gleditschia, sumach, the tulip-tree, salisburia, and all the leading varieties of *Cratægus* or thorns. These of themselves make the borders look gay all spring and part of the summer. The more dwarf shrubs must come forwarder in the border, and must be placed here and there the whole length, one rank forwarder than the trees we have mentioned. The dwarf flowering shrubs are numerous, but they are less trouble than any flowers that are merely herbaceous. The rhododendron and azalea, the *Magnolia conspicua* and *purpurea*, roses of the China kinds which flower all the summer, honeysuckle of the dwarf kinds grown independently of support, *laurustinus*, lilacs, *Pyrus japonica*, *Kalmia latifolia*, the gum cistus, and others, all contribute their flowers in abundance, and if very judiciously planted along a considerable space, almost furnish the March, April, May, June, and July months ; but the number of hardy perennials that aid in the general effect and continue flowering till November is almost endless. All the hardy bulbous kinds are remarkable for their beauty. The lilies, the hollyhocks, *Lupinus polyphyllus* and varieties, *Aconitum variegatum*, *antirrhinums*, especially the species *pictum*, all the hardy irises ; the old golden or Aaron's rod ; all the phloxes ; and as a finisher, the chrysanthemums and Michaelmas daisies. There are many others that actually require no trouble after once planting, unless it be once in two or three years to regulate the size. The tuberous-rooted spread enormously, and may be reduced by chopping off pieces till the shape and size are adapted for the place ; the bulbous-rooted may be reduced by taking up once in three or four years, and replanting fewer, and those of the best, while the smaller and weaker may be condemned to nursery-beds, or transportation somewhere else ; the fibrous-rooted may be chopped less, or the roots may be parted ; but in very large borders very large patches of flowers are allowable, and in general the effect is the more grand and imposing.

With regard to giving a little extra brilliance by a little extra trouble, there are many things that might be employed to help out the effect ; but still where the grounds are extensive it will certainly increase labour, otherwise some annuals might be sown all round the place, and be left pretty nearly to themselves ; such, for instance, as *nemophila*, *coreopsis*, *convolvulus minor*, *eschscholtzia*, and *Zinnia coccinea* ; and if a little further trouble be not begrudged, dahlias may be planted at intervals, and China-asters, ten-week stocks, wallflowers, sweetwilliams, may at a proper time be planted out. However, all this must be adopted or otherwise, according to the labour at command. Perennials will not occupy a day, where the system of annuals and bedding-out plants would occupy a week ; or in other words, one man may manage an immense border, where nothing but permanent perennial flowers are used, while seven would not be able to do the work for a highly kept border of the same extent, made up with the addition of annuals, biennials, and bedding-out plants. If the latter be adopted, the *verbena* and scarlet *geranium* should be propagated in great numbers, because they are never worth taking up after flowering ; it is far better to propagate them in time, and leave them to bloom in the borders until the frost cuts them up altogether.

It will occur to the reader, that an extensive border, kept up in the style of those neat little borders and beds in the flower garden, would require constant labour, and a good supply of the needful seeds and plants ; but that a border of perennials requires only to be kept clean, and the principal work is to cut down and clear away all the upper growth of whatever has decayed, and to prop any of those plants which are weakly in themselves, or liable to be broken by the wind. The *chrysanthemums*, perhaps, want more of this than anything else ; but they are so useful when most other things have gone, that one willingly undertakes the task, only to secure a late bloom. There are seasons when we are denied this—when some envious frost cuts off the flowers almost before they appear, and we lose them ; this we cannot help : it frequently happens, however, that while they are cut off in open places, they escape under plantations, and in particular situations ; so that they are always worth the little trouble they give. Dahlias also require stakes to protect them, or rather strengthen them against the wind, which would other-

wise break them all down. The worst part of the whole year for a border is when the last remnant of flowering plants is cut down; then there is nothing left us but to clear the ground of all decaying vegetation, and living weeds, and to fly for help to our potted shrubs, or be content with what is already there, until the spring again brings forth the early flowers to brighten up the landscape. But the period from November till February is not very long, and if the place be studded with a Christmas rose here and there, the laurustinus will bear it company, and flower during the most dreary months; and the almond will soon take up the subject, and commence a brilliant season among the trees and flowering shrubs. The crocus and snowdrop in respectable patches, and not often disturbed, will soon commence their show, and early tulips, which are more hardy than the late ones, will assert their privilege of exhibiting their brilliant coats soon after.

One of the principal duties is to gently fork over the border between the plants as soon as they have all come through the ground; if done before, there would be great danger of injury to some of the bulbs and roots. Another is, to use the knife pretty freely to the shrubs, to keep them within bounds, to cut away any too luxuriant shoots, and to keep their roots clear of other subjects, by removing anything that seems to encroach too much. All the suckers should be removed from roses and other shrubs, and be either planted in nursery-beds or taken elsewhere, to become in their turns principal plants. All shrubs that are worked on common stocks should be especially looked after; such as variegated hollies, which, if the stock was allowed to grow, or to throw up suckers, would, in a year or two, totally destroy the worked or variegated portion, and become a rank-growing wild bush. The magnolias of a choice kind may have been worked on common stocks; and if so, the stronger sort would prevail. In short, the stock on which a finer sort is grafted or worked, will, if permitted to grow, soon deprive the worked portion of all nourishment, to its ultimate destruction. The various cytisuses are worked on the common laburnum, which in a single season would, if let grow its own way, overpower the worked part, and become a simple laburnum again. Azaleas of a scarce kind are frequently worked on the *A. ponticum*. Rhododendrons of fine sorts are frequently worked on common stocks, and roses of the more valuable varieties always. These

facts require that the gardener should always be on the alert, and be jealous of even a live bud on the stock part of anything, and still more so of a very strong sucker from the root. It is never good for a plant, even if the plant be on its own bottom, as it is called ; that is, rooted of itself, and growing on its own root, instead of being grafted or budded.

The larger flowering trees should, while young and manageable, be pruned to some reasonable form, not clipped into a ball, nor trimmed into a sugar-loaf ; but vigorous branches, rambling out of place, so as to overbalance the tree, as it were, or make it one-sided, should be shortened ; branches arising where they are not wanted should be taken away altogether ; a head that it is desirable to see broad should, if it show an inclination to run up, be shortened down to excite side growth ; and a little attention of this kind would be easily bestowed, and well bestowed, after the trees have bloomed, so that the new growth of all the trees shall be well directed.

All flowering shrubs and trees are best pruned before the spring growth commences, but after the bloom is off, because when a tree has completed its growth, we cannot touch it without taking away bloom ; and it is as well to get all the flower we can, and, when that is over, to use the knife.

As it frequently happens that the borders and boundary plantations are overrun with ill-grown trees and shrubs before a gardener gets to them, he must do what he can towards renovating them ; he must use the billhook freely, and cut his way into them a little. If, as is often the case, some well planted and well chosen selection of trees and shrubs have been neglected for years, the scarlet horse-chestnut may have become a common one ; the scarlet and double white and scarlet *cratægus* may have turned to a common white or black thorn ; the hybrid *rhododendrons* and *azaleas* become common *ponticums* ; fine *daphnes* may have been metamorphosed by time and neglect to the common *spurge-laurel* ; and the most beautiful varieties of *holly* are merged into the commonest of all the green ones ; and all this simply by the means we have mentioned : the stock has grown, and being infinitely more vigorous than the more delicate varieties worked on it, the neglected growth has prevailed, and starved the worked portion to death. Such is the constant struggle that nature makes to assert her rights ; and she is only to be controlled by the constant remedy which we should all apply to growing

evils—"nip them in the bud." In a quantity of roses budded upon common briars, a man may every third day be employed rubbing off the buds of the stock where it is going to shoot; and if they are neglected a week, the shoots from the stock will sometimes be a foot long.

To return to our border, which has become a mere thicket of aboriginal trees and shrubs of no value, the first thing that suggests itself is to clear away a little, and get everything to some shape, or remove it; and let the first job be to graft all the worthless stocks with good sorts of what they have lost. Except here and there a handsome green holly, which may be left, graft all the others with variegated kinds. So with the rhododendrons and azaleas, unless you choose to spare any that have grown into handsome form, let everything be worked over again with the sorts most desirable; and as the stock will make greater efforts than ever to regain the mastery, they must all be constantly watched, and every bud that appears on the stock portion of the plant must be rubbed off as fast as it comes. By these means, you will in a season or two restore some of the best things; because the stock being exceedingly vigorous, through being cut back, the newly worked sorts will grow rapidly, and make quite a show in a couple of seasons. The height at which all the stocks should be worked depends on what you want them for: you may make standards of any height you like, or cut them down low enough to make a bush; but, generally speaking, the tree should speak for itself: they should be worked as high as you want the head to be; and if the plants be wanted as bushes, the nearer the ground you work them the better. But this rather belongs to the chapters on budding and grafting than to this; and the whole feature rather belongs to "The Improvement of Estates" than to the management of borders.

THE GREENHOUSE.

The greenhouse is always, after a pit or frame, the first glass structure that anybody erects, and the only one that a builder who wants a tenant in the country thinks of building to go with his house. Wherever there is a glass house of any kind, it is called a greenhouse: it is one remove from the garden-frame, or pit; and when there is no other horticultural

building, it is invariably used for a mixture of plants of all families. But there are certain appropriate plants which will so far accommodate each other as to wants and sufferings, that where one will live another will be doing well, and by a little care a goodly show of plants may be maintained.

The ordinary form, and the best, for a greenhouse of this kind, is a "lean-to," as it is called; that is, a wall of the proper height forms the back; the front is two feet six of brickwork, or thereabouts, and two feet of glass; a table or shelf, two feet wide, or, if the house be roomy, perhaps two feet six inches, next the window, and a stage sloping like the roof, the front shelf the same height as the front table, and rising, shelf above shelf, to the top. The width of the house from front to back is generally according to the room; it should not be less than twelve feet; but a roof made of two eight-foot lights, and at an angle of forty-five degrees, would be advisable. The heating required in common of a greenhouse is only enough to keep out frost, and a degree or two of frost out of doors will hardly penetrate in a night; so that many people prefer the common flue to hot-water pipes, as the heating is more permanent, except in a hard and continued frost.

The greenhouse, in places where there is no other glass building, requires a careful selection of plants, first to keep up a diversity, and second to mind that there be none but will agree with each other in treatment, and do well with the like attention. Camellias are the most important, because they are noble plants in or out of bloom, and in themselves afford considerable variety; the red, white, blush, pink, and striped form pretty contrasts; and this family is by no means tender, or difficult of management. Azalea indica, quite as hardy, follows with its gorgeous flowers before the camellia has left us, and of this we have scarlet, crimson, pink, light-rose, purple, white, and striped. Hoveas give us a rich deep blue pea-flower early in the spring, and are as hardy as either of the above. Cytisus racemosus yields a rich perfume, and is a perfect mass of golden-coloured flowers. It is impossible to overlook geraniums, which are such general favourites, and while we attend to some of the showy novelties, we must not forget to provide half-a-dozen of the dwarf scarlets to stand here and there in the house, for they give a brilliance which hardly anything else will to the miscellaneous collection.

Cinerarias, from their gaiety and early blooming habit, ought not to be omitted, and for the winter, Chinese primroses afford some variety and are very beautiful. So also some heaths may be selected for the sake of their bloom in the winter months, and because they will stand among the other plants we have mentioned. The acacias are an interesting tribe, nearly all yellow or straw-coloured flowers, but for the most part very abundant blooms, and as hardy as anything we have mentioned. *Chorozema varium* and others make a variety of foliage as well as flowers, and are adapted for greenhouse culture. There are many other plants that would take people's fancy, but a house well filled with these would be highly gratifying, whether there were a few of the best kinds, or a more general collection of each.

The greenhouse may be built cheaper than any other ; the glass need not be more than six inches by four all over the house ; it wants no puttied laps, no particularly expensive wood-work, and the brick-work quite plain ; the top-lights may slide down, the front-lights swing with hinges from the top, and opening outwards, to be propped out by common fastenings, or they may be made to slide, in which case, however, the front can but be half opened at any time, because one window or sash must be placed behind another. In the former plan the whole range can be propped out, and if it were at all desirable, they could be made to push out square with the top, to admit the whole space of air. The front table or shelf should be generally used for small choice plants that require most attention, because they can be easily got at, and best seen ; the stage behind will hold all the larger ones, the more gaudy being the most distant ; a camellia, for instance, could be seen from the most remote corner.

The greenhouse, however, besides holding all such plants as we have mentioned, would forward hyacinths considerably, and produce the flowers of all bulbs a month or six weeks earlier than the open ground, and perhaps nothing would contribute more to the beauty of a greenhouse cultivation than a few well-chosen hyacinths, narcissuses, &c., to interperse among the other plants. The greenhouse, in large establishments, is employed to assist in supplying the conservatory ; so that as soon as camellias, or azaleas, or any other plants, are found enough in bloom to be interesting, they are removed to the conservatory, and their places filled by such

plants as may be brought forwarder by their removal from the open ground. Roses, for instance, are forwarded by removal to the greenhouse, and if they are intended for forcing in a warmer temperature, they should always be commenced by a change from no protection at all to that afforded by the greenhouse ; and when inured to this, they may be placed in the forcing-house, kept at first down to a low temperature and gradually increased ; but roses bloom well in a greenhouse without any other aid than the mere absence of frost and chilling winds.

In large establishments there are several greenhouses, honoured, it is true, by the names of the plants to which they are devoted, but all requiring something like similar treatment,—that is to say, to be kept dry, cool, and free from frost. The camellia-house, the heath-house, the Botany Bay-house, and the azalea-house, are only so many greenhouses devoted to camellias, heaths, Botany Bay plants, and azaleas ; but as a proof that these will do well with pretty nearly the same treatment, we have seen a larger greenhouse devoted to specimen plants, and containing noble plants of all we have mentioned, luxuriating in the same atmosphere, and subjected to the same good or ill usage. The great object is to keep out frost without getting up the temperature too high ; the one is necessary, but all that the house is heated above forty-five by day or forty by night during winter, draws up the plants and renders them weakly. The geranium-house, where these plants are grown upon the system of propping up every shoot, will not do with the common treatment of a greenhouse, for it has to perform the part of a forcing-house as well ; the house is frequently syringed all over, and shut up with the plants at a temperature of 55 to 60 degrees ; then, being in this excited state subject to the green-fly, the plants require to be frequently fumigated,—an operation which, since the invention of Brown's patent fumigator, is not half the trouble, nor a quarter of the expense incurred by the use of the fumigating bellows, or any of the other means usually resorted to. Thus, therefore, although the geranium does admirably in a common greenhouse, and without any other treatment than will do for camellias, and heaths, and Botany Bay plants generally, it is the fashion to force them for May and June exhibitions, to draw them up weakly, and tie them up to scores of sticks to hold them in their places ; but if we

desire to see geraniums in perfection, we must go where they are grown without heat, and with plenty of room, light, and air; where they support themselves instead of requiring props, and where the colour and texture of the flowers are as superior as the growth of the plants. Treat the geranium like the camellia and the heath, the epacris and the azalea, and you will have colour, health, size, and fine foliage; force it, and you impair all; but as forced plants have only to be compared with forced plants, the distinction is not seen; in short, the greenhouse, the single house for the assemblage of all moderately hardy things, or rather, moderately tender things, is the most interesting of the horticultural buildings: it is the cottage conservatory, the pet house of lady gardeners. It stands always open in mild weather; there is always something inviting in it, and it can be always made to supply a few violets, a bit of mignonette, or a camellia bloom, any time in the winter.

THE CONSERVATORY.

This may be called the show-room of the garden, and should be attached to the house, because it will be visited in all weathers; generally speaking, it adjoins and opens out of a principal room; and as it should be a kind of winter garden, it should be large enough to walk in. Of the form and plan, which depend on a diversity of tastes among builders and owners, we must say but little, nor describe at great length. There are some essential points to attend to, and so that these are noticed, we may leave the external style to the artist and his employer.

First, the larger it is, the more convenient and effective; on this account we begrudge every pound laid out in ornament at the expense of size. It would cost as much to build a trumpery thing of ten feet square after some fashions, as it would to erect a plain house of fifteen feet by thirty; and this is the smallest we should care to possess, for it merely allows of an eighteen-inch border all round a three-feet path, and a slab, or, if preferred, a bed of six feet in the middle, and this is as little as can be made subservient to an effective display.

The conservatory borders may be kept furnished with potted plants, whether bulbs, annuals, or perennial shrubs,

and as they decline in beauty they can be lifted, and others, in the same sized pots, dropped into the same holes. The centre, if there be on the establishment store greenhouses, pits, and other nurseries for plants, should be a slab or table, because the plants will be the better for changing, while by this means the conservatory may always be kept filled with flowers. The temperature of the conservatory, in which stove as well as greenhouse plants are arranged, and where forced flowers, which are more tender than either in their actual bloom, contribute to the show, should not be under 50 degrees, because a lower temperature would damage the forced flowers and stove plants, and that atmosphere is not too warm for greenhouse plants; but the greatest care should be taken to keep it down as nearly to that as possible, otherwise the hard-wooded greenhouse plants would suffer, and the bloom of many others would be shortened. In setting out the centre table, the taller plants should be in the centre, and the shorter ones on each side, the shorter of all being on the outside, so that the plants would form a fine bank sloping on both sides. The table should be a foot narrower than the space left for a bed, for the double purpose of giving room to walk and having room for a row of potted plants at the foot of the table all round. The stove and forced plants to be from time to time brought into the conservatory, should be removed a day or two before to the coolest part of the forcing house or stove, to make the change less sudden; because if, as the stove generally is, a plant is in a temperature of sixty-five, the sudden removal to fifty will hurt the flowers that are out; and if the forcing house is above sixty, the same precaution is necessary, as a hardy plant, forced into flower by high temperature, would, by a sudden change of fifteen degrees, be drooping directly. Another precaution necessary is, to remove them as they come into flower, and not wait until the blooms are opened; a bud even forward will not feel a change that would actually destroy a perfect blossom.

We need hardly say that it is quite possible to keep a conservatory well supplied with flowering plants the entire year round. Camellias may be commanded from November to April; rhododendrons, and both Indian and American azaleas, January till July; kalmias, and other Americans, can be made to help out a great part of this time also. Many stove and orchideous plants can be had all winter; bulbs, from

Christmas onwards ; Chinese primroses all winter. In the spring, the greenhouse will furnish cinerarias, heaths, epacrises, hoveas, all the hard-wooded plants, geraniums, &c., which literally form a blaze of bloom. The stove yields a full share of flower ; but the difficulty, if there be any difficulty in keeping up the show, is, when the out-of-door beauties predominate ; but pot-culture of out-door subjects must make up for any deficiency of exotics. The passifloras of the stove will see us through June and July. The hoveas contribute to the good effect. Balsams come at an excellent time to brighten the scene ; and many autumnal roses, grown out of doors, but in pots, may be removed to the conservatory, to aid and assist. Annuals of the better kind, in pots, are of great use, as are late-flowering geraniums, and dahlias in pots. Many climbing plants, and, almost every month in the year, some orchids, enable us to keep up a good show in the conservatory. There is rarely a month in the year without several heaths in flower, and these always last a good while. In short, what with retarding some things, and forcing others, flowers may always be had in moderate quantity and variety.

HEATING.—To maintain a proper heat in the conservatory, some consideration must be given as to the means. The height and size must always be considered. The most complete way, as regards neatness, is, to put the heating apparatus under the path ; but as it is not always the most economical, there must be pipe enough to command the necessary temperature with boiling water, as this requires less attention than any other mode of heating, and is in general more steady. If the pipes are above ground, they are unsightly, but they are more effective ; and where a six-inch pipe and return would be wanted under the path, a four-inch pipe and return would do, and more than do, above. The nearer the pipe runs to the walls at the lowest part of the roof, the better : because, as the heated air ascends, it then takes the whole slope of the roof, and falls in the centre as it cools ; and it is a good plan to have the table formed with a sort of open work or wooden shelves, of half-board width, with half-inch vacancies between them, because it gives less obstruction to the circulation of air, which is always going on when one part of a house is heated.

The glass of the sides should be within twelve or eighteen inches of the ground, that all parts of the building may be

perfectly light; and if we determine to have the pipes above ground, they must be close to the twelve or eighteen inches of brick-work which forms the base under the glass. The two four-inch pipes, one above another, will just occupy the space of the brick-work; and if it be desirable to have them, let there be a back made to the border as high as the pipes, and an open iron shelf upon it, so that a chamber will be formed, and the circulation of air will be increased, if from the bottom of the chamber there be openings here and there conveyed under the border to gratings in the path. We have in all cases preferred the conical boiler, and we do in this; but as there is frequently a difficulty in finding a place for the firing without being an eyesore to the conservatory, it may be necessary to carry the pipes some distance under ground. In this case make a trough under ground to hold the pipes, and fill it up all round the pipes with bruised or pounded pumice-stone (a complete non-conductor of heat), in which the pipes will lose no heat,—at least, suffer no perceptible loss of heat, in twenty or thirty yards of underground transit.

CONSERVATORIES WITHOUT HEAT.—Of late, conservatories have been constructed upon such plans as reduce them to mere covered gardens, without any means of heating, but with all the necessary neatness and closeness required to shut out the external air. Such conservatories would be formed, perhaps, in much the same way as others are for heating; but they are supplied with none but hardy and half-hardy plants. With great care and attention to the shutting-up in time, and not opening till the temperature of the external atmosphere has been raised a little, these conservatories are kept well furnished with camellias, hoveas, azaleas, many kinds of heaths, and others that may be called hardy greenhouse-plants. Numerous climbing plants will even stand all winter; but, with the same management that we have already described, a good deal may be done with plants just got ready to flower, and brought into the conservatory to bloom. The study, however, of a conservatory without heat is peculiar. There is abundance of very hardy and very early things—bulbs in particular—which only require absence of actual frost to bring them exceedingly early; and such as these will give us flowers at Christmas, after a mild autumn. There is no difficulty, then, in relying more on these than on any kind of forcing for spring flowers. The great object is to

watch the gardens for a year, and make notes of all the autumn and very early spring-blooming flowers. By planting these in the borders, or growing them separately in pots, we may command them a little earlier, or a little later. Violets may be had all the winter. Noisette Fellenberg, and the common China rose, may be kept in bloom in pits and houses; and therefore a succession may be kept up in pots, to change such as go out of bloom. The *Magnolia purpurea* and *conspicua*, may be planted out. Rhododendrons and azaleas of the American kinds, and some fine hybrids, will stand a moderate degree of frost, and therefore become very useful. As a climber, *Clematis azurea grandiflora* is the most showy and beautiful of the whole family, and would grow out of doors, to say nothing of under glass. Those, therefore, who object to a fire near the house, or who have no convenience for it, may have their winter-garden under glass, and always have something growing, and blooming, while frost and snow forbids a walk in the open grounds.

FORM OF CONSERVATORY.—The most economical form for a conservatory is a ridged roof. The side upright from the ground to the lowest part of the roof should be not less than eight feet, and ten would look more noble. The roof should rise seven feet six inches, the lights should be five feet nine inches wide, with a tie from plate to plate at every rafter, the nearer the better; and of iron, that it may be light. Climbing plants should be directed to these, so as to form a pleasing feature when covered; and there is great choice for the purpose among the *passifloras*, *clematisses*, and other robust and showy families. The top-lights should let down, the side-lights, or upright glass sides, as they may be called, should all open; and as the more convenient and elegant, as well as useful plan, they should be sashes like dwelling-house windows, the lower ones to push up, and the upper ones to pull down. The glazing of the sides may be of large glass panes, but for the roof six inch width is enough, and the length may be anything; but, for economy, six by four is large enough, and by far the cheapest. If the conservatory be planned thus, without any extra ornament, due regard being had to neatness, good workmanship, and clear glass, you may build such of a much greater extent for the same money, than you could any of the more fanciful kinds, which cannot but get out of fashion as taste changes; but as this

form is the best for use, the best for plants, the most convenient, and the most economical, it will never get out of fashion. The interior will be all that can be wanted. The outside will be the form of a thousand others; the least likely to take from, or spoil the beauty of the house; the best adapted to show off the plants, and the easiest managed.

The luxury, for such it is, of a winter garden under glass, may be imagined better than described, when we speak of one under our own management. The wind was east; the front park of the mansion covered with snow, which was drifting in our face, and almost blinding us and the horse we were driving; the thermometer down at 22 degrees. Nothing could be more dreary. A few steps across the hall of the mansion to the drawing-room on the ground floor brought us to another climate. The large glass doors of the conservatory were thrown open; there was a good fire in the room, but the conservatory ranged 50 degrees, and the centre table had a superb bank of flowers, as gaudy as can be imagined—splendid camellias, rhododendrons, *Hovea Celsi*, *Azalea indica alba*, *Epacris grandiflora*, three or four heaths, some fine orchideæ, especially *Oncidium papilio*, numerous bulbs, violets and mignonette, a few China and forced roses, formed a mass of beauty so utterly out of season, and contrary to the season out of doors, that, notwithstanding we had seen the contrast over and over again, it was so striking after a month's absence that we hardly know whether we felt till then the real charm of a conservatory.

But we have had occasion ere now to caution those who have conservatories opening into the house. Every day the many gallons of water given to the plants evaporates and rises into vapour to settle on the various objects within reach. Therefore in the drawing-room, or the room adjoining the conservatory, there should be nothing that will take injury from damp, because it will settle in pure water on the walls, and sink into tapestry curtains, the backs of paintings, the covers of sofas and chairs; in short, it will lie or hang in drops on whatever will not absorb it, and sink into all that will. Besides, therefore, having nothing that will take injury in the room adjoining, there should be great care taken to keep the conservatory doors shut, except when really required open, and when open to keep all the communications that go from the room to the house closed. The conservatory should

always be kept as open as the weather will permit, to give air to the plants and let off the wet, which may be seen, when the house is closed, running down the windows and walls in copious streams. There is no good without its evil, no enjoyment without some corresponding trouble to maintain it. The conservatory, so great an ornament, so exquisite a luxury, may, without care, be the means of producing sickness in the house, destroying the furniture and ornaments, and doing endless mischief, unless it be counteracted by attention. Let the throwing open of the doors be the exception and not the rule. Keep the damp air from the house as you would a pestilence. It is delightful to smell the perfume, but it carries poison with it if allowed to make its way all over the house.

The same argument tells against keeping too many plants confined in dwelling houses ; remember that if you pour a few quarts of water once a day into the pots in which they grow, it will be all gone in a short time in vapour, and settled by condensation in your curtains, looking-glasses, pictures, the paper on the walls, and into your own lungs. If you must have plants, let the windows be open in summer and moderate the number in winter. It is not that plants are unwholesome, or the perfume injurious ; it is simply the dampness which arises from the soil, and which you charge ready to go off again every time you put water to them. If the same quantity of water were sprinkled all over the floor of a bed-room, as is frequently given to the plants in the same room, the occupant would fancy the damp would almost kill her ; but gallons are distributed among the plants, which give it off again in vapour as surely, if not so quickly, as the floor would. Where, therefore, you keep plants, let them have all the air all the day ; and that you may suffer as little as possible from dampness, water them the first thing in the morning, and open the windows. In winter this can only be done on fine days ; but, fortunately, in winter plants want but little moisture, because it evaporates so slowly as to be of no consequence.

THE MAKING OF HOT-BEDS :

THEIR USES AND THEIR GENERAL MANAGEMENT.

The common acceptation of the word hot-bed is, a garden frame and glass heated by dung, though there are many now heated by tanks and hot water ; and, instead of the wooden

frame, they are built with brick in many different ways, and are called pits. The common dung-bed will always be used ; for, notwithstanding the great facilities afforded by means of hot-water apparatus, there are many advantages attached to the ordinary frames and lights heated by means of stable-dung, leaves, and other fermenting matter. In the first place, the dung, after it has performed its office, is, at the end of the season, almost invaluable as manure, and especially for mixing with pot compost for plants.

In almost all the instructions for growing potted plants, we find among the principal ingredients mentioned for the compost a portion of well-rotted dung from an old melon or cucumber frame, and in most cases it is found to be sufficiently decomposed at the end of one season to answer the purpose well ; in fact, it is dung rotted into mould. In the next place, the cucumber and melon can be grown well enough in such frames to compete with any that are grown with the more expensive pit. The dung-bed may require more attention to keep up the heat, but it seems to repay us well for all the extra attention that we have to pay. And, thirdly, we have all the advantages of beginning when we please, and of placing the beds where we please ; moreover, frames and glasses are always useful, as the means of protecting many potted plants through the winter, even when used without the dung. The only difficulty we have to contend with is to keep up the heat pretty regularly in the forcing season, and our object is to show the correct method of accomplishing this.

FORMATION.—Let us first, then, choose for the situation a place well open to the south to catch the benefit of the sun as soon as it is well up, and retain it until it goes down. Here we place the frame on the ground, and drive into the ground, at one foot distance from each of the four corners, a stout upright stake, leaving three or four feet out of the ground. We may then remove the frame and build our dung up to the height of the four stakes, and even a little higher. But that we may have a regular heat, and plenty of it, the dung must be well prepared for the work before we use it. This is done by shaking the heap out with the fork every four or five days, changing the place of the heap each time, and, if the dung appears at all too dry, it must be sprinkled with water every now and then,—say every foot that we add

to the heap ; and when we have removed the entire heap, it may lie together until it steams a good deal, and is fresh heated as it were. In turning it back again to its old place, it must be well shaken out and lightened up ; for on the manner in which this part of the work is performed depends a good deal of the regularity which we desire to preserve in the heat of the bed hereafter. Sometimes two or three turnings over are enough, at other times the dung is so hot as to require more frequent turning and sprinkling. With this hot dung so prepared, we spread the ground all over evenly between the stakes, keeping the outside square and even, and patting it down with the dung-fork to make it equally solid as well as equally thick all over. By continuing this until it is even with the tops of the stakes, we may consider the heat nearly provided ; but the next day we shall find our work sunk down a little, and we may then add to the height a little to ensure four feet thickness in front, and we may raise it six inches higher behind, but the centre must be as solid as the sides ; it must therefore be patted down even, and dung added wherever the surface has sunk. The frame, which should be well cleaned, may then be set on the top, perfectly square with the dung, which will project one foot all round. In a day or two the heat will be perceptible, and we must ascertain the temperature of the centre by plunging a thick smooth stake into it from the outside, and making it reach to the centre, then withdrawing it, and feeling the heat of the end of the stick, which of course will be the same as the centre of the dung. If it be too hot, and the dung is drying and burning, we must undo a part of the work, or it may be so hot as to require it all to be undone. This, however, is seldom the case ; and we believe we may say never, if the dung be properly prepared beforehand. In two or three days the heat will come up, when about three inches of good loam, not too stiff, may be put all over the dung inside the frame. This keeps the air sweet within the frame, and the bed is ready for anything. It will do to raise seeds in pots, and to bring up plants after they are potted until they are too large for the frame. It will do to grow cucumbers or melons, or for anything that heat is required for. Supposing, however, that it be for cucumbers or melons, we recommend the plants to be all got ready in pots before the principal bed is made ; and, as these are but three or four weeks raising, most people

make a small hot-bed with about two feet thickness of dung and a small frame and glass, and the cucumbers and melons may be sown, the former three, the latter two seeds in a pot ; these are soon up, and as soon as there are two rough leaves, the eye should be pinched out. This makes them grow strong and stocky instead of running away, and the plants will cover the pots in a month.

The preparation of the dung for the permanent bed may be begun when the seeds have come up, and by the time the plants are large enough to bed out, this principal bed, made up as we have directed, will be ready to receive them.

We have said nothing about the number of lights to be provided for, because, whether we prepare for a one, two, or a three-light box it is the same ; and if there be a range of twenty lights, they are put close to each other, and the dung projects only behind and before, and at the two ends ; the operation is precisely the same, but merely extended. Presuming the pots of plants to be ready, and the beds made up as we have directed, a barrow of loam should be put in the centre of each light, heaped up like a cone ; then with the hand form a hollow in the centre of each heap, and take the ball of earth whole, with the plants undisturbed, by tapping the pot on the edge with the hand placed so as to receive it plants downwards ; turn the ball up and make the hollow in the centre of the heap, as it were, low enough to let the ball rest upon the three inches of loam, and adjust the loose loam round the ball, but still keep the form of a basin, because, in giving water to settle the earth to the ball, it will not run away. Cover up the frame, and give air by tilting the glass up behind a little. The roots will in a few days make their way through the sides of the heap, when more loam must be put round, and the edge of the basin may be levelled down ; by adding loam every day a little, or perhaps even alternate days, you fill the frame up, so that there is a good nine inches of loam in the middle, but not quite so much towards the frame. The plants will soon begin to grow fast ; and, as the object is to distribute the shoots all round, so as to cover the surface, you have merely to regulate them as they grow ; and if all the vigour of a plant seems to go into one shoot, stop it back to two pair of leaves, to induce side shoots ; and if all the main shoots seem to give no signs of fruit, stop them back a little. The heat will keep up for weeks if the glass

be well covered at night, and shaded through the strong heat of the sun.

When the fruit is coming, let but two or three swell at a time upon any one vine, and even these should be in different stages of growth, so that one may be cut when another is half-grown. In melons, the same should be observed, for if too many fruit be allowed to swell at once, about the same age on one vine, they will not be so fine, either in growth or flavour. Watering occasionally, and giving air to keep the temperature moderate, are the principal things required; but melons must not be watered too often, and as they ripen no water should be given until they begin to flag. Thus much for the hot-bed, as far as we have gone; but we must now suppose the hot-bed begins to cool a little and some fresh supply of heat is required; if so, remove all the projecting portion of the dung, and even rather undermine the bed than otherwise, by taking away even more than the projecting dung, and replace all of it with hot prepared dung, fully as much projecting as there was at first; this will give new vigour to the bed, and raise the temperature equal to what it was at first, and this may be repeated every time the heat declines. It will therefore be seen that the preparation of stable-dung for use is an essential duty, and keeping plenty on hand to supply new turnings is a matter of necessity. Now whether this hot-bed is made in any month in the year, the process is the same, and the production of cucumbers in January is no more difficult than in June. We do not say but that they may want more attention, but there is no more uncertainty nor difficulty. Hot-beds are useful even when we have had all the cucumbers off and done with the vines, because nothing can be more favourable for sowing salads, radishes, onions, or anything else out of season, or for planting potatoes, for they require less heat, and progress well under glass. In a good establishment hot-beds are made to succeed each other, and the old ones are turned to account; some are planted with violets to bloom through the autumn and winter; in fact, they are at all times useful, for a slight heat lasts a very long time.

BRICK PITS.—There are many ways of constructing beds to be heated by dung; many brick pits are so constructed that hot dung can be placed round the inner brick-work, the lower part of which is made with holes, above which inside there is a false bottom to hold the soil, and an empty chamber

underneath ; about two feet from this inner brick-work there is a four-inch wall, as it were, leaving an eighteen-inch vacancy between that and the inner one all round. In this vacancy is placed hot dung pressed down close, the heat of which goes through the holes in the sides of the chamber, which is thus raised to a considerable temperature and forms bottom heat, while the dung being heaped up outside to nearly the top, adds to the temperature of the air within the pit. This kind of pit or brick frame is built two feet under the ground and two above ground, the outer wall being only built up to the surface of the ground, and the dung being heaped up to pretty near the top of the inner wall. The advantage of these pits is, that the dung can be changed when it cools, and new hot dung be put in its place as often or fast as we please, without the risk of disturbing anything that is growing.

Another kind of dung-pit is constructed on pieces of brick-work, to be hollow underneath, with only a bottom of thin boards, and the hot dung is put between these brick piers, filled in quite solid, and with a goodly quantity of dung also outside. This can be changed in the same way as often as the temperature declines ; but although we have practised with all these, there is nothing for simplicity and economy that beats the ordinary wooden frame and glass, as described at first. In nurseries, where these are used in great plenty, the ordinary size of the frame is, with lights, five feet six inches from back to front, and three feet six inches wide, the back of the frame being from twelve to eighteen inches high, and the front from six to ten inches high, so that there is a little slope naturally, if laid on a flat surface of dung, and the dung may be laid sloping, so that there would be a still greater slope, in fact, more or less, according to our fancy. In private gardens, eighteen inches for the back and nine inches for the front, is a good proportion, or as the cutting of the boards to make them is generally managed to avoid waste, one board high in front and two boards high behind is a very good proportion. But according to the shallowness or the height of the frame, so the wood is set down on the dung, or set on part of the thickness of soil, because there ought to be six inches of soil in the shallowest parts, and nine inches in the centre, and if this were all inside the wood-work, there would not be sufficient room between the soil and the glass in a shallow frame.

Some gardeners have a portion of the ground excavated for two or three feet, and a brick pit of four-inch work built, so as to reach two feet aboveground, and fill this with dung or leaves, or tan, or a mixture of all, pressed as closely as possible together, within a little of the top, so as to just leave room for the soil above and the growth of the plants; this will give a gentle heat some time, but the objection to this for plants to grow in the soil is, that it sinks as the fermentation goes on; but for pots to be grown in, the sinking is not of so much consequence, as it does not disturb any roots, and generally the plants grow quite as fast as the mass sinks. This kind of hot-bed, made of tan only, is very useful, as the tan is naturally sweet and requires no soil at the top; the pit can be filled, and pots can be sunk in the tan just as they are in a stove; such a bed will do to force almost anything in pots, and a general heat will last much longer than dung or leaves. Many plants grow better in a dung-bed of the ordinary kind, than in any kind of house. The *Gardenia radicans*, which blooms in very small pots, is grown by thousands in common dung-beds for the market, and in no other way will it grow so fast or so free from the red spider, which is almost sure to attack it if long at rest. Probably there is no means of growing plants more rapidly than in dung-beds, from the moist atmosphere with a high temperature; and the plants, being necessarily close to the glass, everything grows fast, without drawing half so much as they would in a stove of the same temperature. On this account many small things are forced in hot-beds; roses in large quantities, especially of the small kinds, are easily bloomed in sixty-sized pots, and a single frame holds a vast number; besides which, the uses of hot-beds in bringing forward chilies, tomatoes, capsicums, and other things to plant out, can hardly be rated too highly. Nor, with all the contrivances that different people have made, is there anything so good for the propagation of dahlias, and various other plants from eyes and slips. We have seen the pine-apple grown by hundreds, with nothing but dung heat, and have ourselves grown one from a crown to fruiting with dung heat, and a wooden frame only; not but it was ten times more trouble than it would have been grown properly, but it was nevertheless done. Then for balsams, and cockscombs, *Rhodanthe Manglesii*, gloxinias, achimenes, all dwarf stove-plants, they will grow cleaner and with less trouble in a

hot-bed than any other way ; but these are make-shifts, not recommended to people who have other conveniences, but mentioned to show that the common dung hot-bed is capable of being made subservient to many uses.

Many large establishments with stoves and forcing-houses make, nevertheless, great use of dung-beds, and small establishments where there are no stoves make the hot-beds do all the forcing they are obliged to have ; thus, herbs of many kinds are potted up to force as they are wanted ; fennel and mint, among the rest, being in request weeks before they can be had in the open air. The uses of the dung-bed can therefore be hardly over-rated, and there is a good deal to be done with them for flowers generally ; small American plants, Persian lilacs, azaleas, cyclamens, all the spring bulbs, and many other flowers may be forced in a frame as well, and from its convenience of growing things close to the glass, often better than they can be done in the ordinary forcing-houses. But one of the uses to which they are almost universally applied is, the growing of cucumbers and melons. Wherever hot dung-beds are used, there is occasion for great neatness and order ; the dung ought to be piled as square and as straight as possible, and the place around the bed kept clear, that any one may walk round to look at their contents ; generally the beds are made in a place set apart on purpose, and dignified with the name of the melon-ground, and it is possible to have this as tidy as the rest of the ground. The ordinary material for covering at night is bass-matting, but of late there are so many cheap fabrics in the cloth way, that many persons adopt waterproof material, not so thick as to exclude light, and yet generally of quite substance enough to keep the heat from escaping. Many cover with litter, with a notion that the thicker the covering, the more warm a thing is kept ; but the operation of a covering is merely to prevent heat from escaping, and any non-conducting medium is preferred ; woollen would therefore be warmer than calico, independent of its thickness, but waterproof cloth is found to answer all purposes, and to keep the frames much warmer than any matting or litter. The dung of the frames when done with should be divided into two heaps, one of which is ready for use for potting, and must be placed by itself ; the other, which is the outside lining and loose stuff, is not decomposed, and may be laid in a heap to rot, or be used for the

ground, for which it is better adapted than that which has rotted to mould, because, not being decomposed, it will lighten the ground more, and let the air in ; but all the dung that is immediately under the bed has fairly decomposed into mould that can be run through a sieve, and may be mixed with anything or everything for immediate appropriation.

According to the different purposes to which a hot-bed is to be appropriated, so must the wood-work be adapted by its make and dimensions. In raising the seeds of annuals and of cucumbers and melons, and for growing them afterwards, the ordinary box and light is sufficient, and whether single light, two, or even three-light, will make no difference ; but when a box and light is made for forcing flowers or forwarding plants, or anything requiring height, the back should be two feet six inches high, and the front one foot six, and the width should be four feet. In growing small plants up from seed, such as balsams and cockscombs, or other tender annuals, they will do very well in the ordinary box until they pretty nearly touch the glass ; they may then be transferred to the deep box, and set on pots reversed to keep them tolerably well up ; for no plant does well far from the glass ; nothing can prevent their drawing up long and weakly in comparison to those grown near. As these plants advance, the pots they stand on must be changed to shorter ones, till at length they may stand on the bed itself, and perhaps even then soon touch the glass ; there is only the alternative then of sinking the pots in the bed, or raising the woodwork of the frame on pots or bricks, and piling soil up against the sides to keep in the heat, and keep out the air.

One of the nicest of the operations in the management of hot-beds is the giving of air, and letting out of the steam ; generally the hot-bed may, when at the height of its warmth, be kept a little tilted behind, and when the sun is out very hot and bright they require shading ; but the use of a glass is almost indispensable. The temperature must be managed according to the work it is doing ; cucumbers and melons will bear eighty to ninety degrees well, but the lowest should be sixty-five, and the highest seventy-five, so that when you find the heat up to that, increase the admission of air.

CUCUMBERS.—One of the unalterable rules in the management of hot-beds is, to water everything with water that has stood in the frame till it is of the same temperature. A vessel

with water should always be in the frames ; nothing does plants in general more harm than watering them with the water at a lower temperature than the atmosphere they are growing in, and this applies more especially to cucumbers and melons, which are very susceptible of chill ; and where the quantity of frames renders it difficult to keep a sufficient quantity of water of a right temperature, get hot water from the house, to put in among the cold, that it may be raised to the proper temperature ; lukewarm water, even when of a higher temperature than the frames, greatly accelerates the growth of plants. We might as well here correct a popular error, which even Abercrombie has promulgated. He says, truly enough, that there are the male and female blossoms on the same plant, but he says the male blossoms are absolutely necessary, by the dispersion of their farina, to impregnate the female, without which the fruit will not swell, so that he actually directs the farina of the male flower to be applied to the female artificially. "At the time of fructification," he says, "watch the plants daily, and as soon as a female flower and some male blossoms are fully expanded, proceed to set the fruit the same day, or next morning at furthest. Take off a male blossom, detaching it with part of the footstalk ; hold this between the finger and thumb, pull away the flower-leaf close to the stamens and anthers, or central part, which apply close to the stigma or bosom of the female flower, twirling it about a little to discharge thereon some particles of the fertilizing powder. Proceed thus to set every fruit as the flowers of both sorts open, while a lively full expansion," &c. &c. ; and then he says, "in consequence, the young fruit will soon be observed to swell freely."

All this has been acted on from sire to son for centuries, and yet, for the purposes of eating, it has been found that nobody considers the seeds in a cucumber at all desirable, and that the fruit is fortunately better when not impregnated than when it is. In fact, it is a question whether, by way of prevention, it may not be worth while (for we have acted on it) to pull off all the male blossoms before they expand, and thus secure the non-impregnation of the fruit ; if, however, we desire to save seed, the fertilization of the fruit intended to be saved must be secured, and the sooner the better, first, because it secures the truth of the variety, which might be endangered if left to chance impregnation by the bees or

other insects, who are as likely to bring pollen from another kind as not ; but nothing can be more erroneous than to suppose impregnation necessary to the perfection of the fruit for the table. The artificial impregnation has been always recommended for the winter and spring months, before there were bees and flies to perform the work ; but it is perfectly unnecessary : the only difference between a cucumber impregnated, and one not so, is, that in one the seeds will be better developed in early days, and be fertile when ripe ; while in the other, the seeds are never fully developed at all, and never swell to their size, nor germinate. It is the same all through nature in the vegetable world : the nut will grow though it have no kernel—apples and pears will grow even when they have no pips ; the pods or seed-vessels of everything will grow, and the seeds half-grow, without any impregnation, natural or artificial,—the only difference is that the seeds will not germinate. Cucumbers and melons, when we are anxious about the correctness of the sort, should be propagated from cuttings ; young shoots, with one joint above ground and one below, will strike freely in a bottom heat, in an atmosphere of 70 degrees, and plenty of air when the temperature rises above that ; put them round the edge of a pot, and water them with water at the temperature of the bed ; pick off any bloom that may make its appearance, and pinch the heart out as soon as it makes a fair start ; but it is of no use trying to strike them with a low temperature, nor depending on old shoots.

Layering is also a favourite mode of propagation ; for we are sure of the individual sorts by that means, as well as by cuttings ; but, when pegged down with a sharpish bend, the shoot will continue growing ; and, as soon as it has rooted, cut back the shoot to one joint above ground, and cut the connexion with the parent plant ; and after it has been alone three or four days, pot it up with all the fibres. These cuttings, or layers, fruit much quicker than seedlings : perhaps the fruit is not quite so large, but there will be more of them that we should let grow ; for they begin to bear as soon as they begin to grow, and continue till they are exhausted. The thorough dependence that can be placed on the sort is worth a sacrifice ; and we have been astonished that nurserymen have not made a point of keeping melon and cucumber plants in stock, the same as any other bedding-out plants ;

for good plants of a good sort would fetch a liberal price, that would pay any one for the care and trouble, only it would be necessary to let every one know where such plants could be had.

One more use to which hot-beds can be especially applied with advantage is, for the close-grafting of camellias, rhododendrons, azaleas, and the orange tribe; the genial moist heat so necessary for these operations cannot be supplied so well by any other means as the common hot-bed will produce it. We have seen, at the late Mr. Ronald's, a hundred and eighty grafts of the *Rhododendron campanulatum* growing beautifully in a dung-bed heat of 70 degrees, with the back tilted at the time to admit air and let out steam, and not a single miss among the whole; and, at another place, as many inarched camellias not cut off as a three-light box would hold; and, at another time, above a hundred grafts, with only a single leaf on each, put on within two inches of the pot, every one taken, and growing well, at a temperature of 65 degrees. Commend us, then, to the common dung hot-bed, as one of the most useful adjuncts to a moderate garden.

MUSHROOM BEDS.

We have already given a long account of the best way to make hot-beds, and with it their general management. Perhaps there is not a more valuable department in a garden where the produce is esteemed, than the mushroom bed, be that where it may. Some require such a constant supply of that excellent fungus, that considerable expense is incurred in the erection of a mushroom-house, and various contrivances are resorted to for the purpose of producing them in perfection and abundance. The production of the mushroom is so unlike any other operation in gardening, that a man may be well acquainted with all the rest of his duties, and be ignorant of this, although the supplying of a considerable family, or even of the market, is now reduced to the most simple rules. While all other garden productions are the result of sowing, or propagating by ordinary means, transplanting, and the like, the mushroom, though unquestionably from seeds which are too small to be preserved or collected, but which are eaten by animals with their food—when all other substances are decomposed, these seeds are left unaltered in their nature and

all their vitality preserved. Hence the droppings of horses laid together, under peculiar circumstances, will encourage the growth of the seeds which have been preserved, and only want favourable circumstances to germinate. It is found that the droppings of horses which have been fed on corn and hay, are more productive of the mushroom than that of horses fed on grass, or other animals fed any how. It is therefore concluded that the seeds abound in harvest or hay time, and that corn and hay are favourable mediums for collecting and preserving them, and it is known that, by laying the droppings close together in heaps, mushroom spawn has germinated so rapidly, when it once commenced, that the whole heap has become a mass of spawn. But it is also found that in places where cows, horses, and sheep congregate, mushrooms abound, whereas in woods, and fields, not frequented by such animals, the mushroom is rarely produced ; but on the contrary, whatever fungi are found are poisonous, or at least unwholesome. From this it would appear that it is necessary the seed should pass through the intestines of cattle, horses, or sheep, to secure its germination. But the seeds may be found in other matter, remaining in a dormant state for any length of time, until a proper degree of heat and moisture brings it into life. Nicol, a celebrated writer on this subject, says he has produced safer, better, and more lasting beds by the following simple means, than he ever could by any other process. He gathered up horse droppings, of which he made a layer on dry ground of six inches thick, then let them get dry, and when beyond the danger of fermenting, covered with two inches of light earth ; then got another layer of horse droppings, whole and dry ones are better than others, and when the second layer has dried, put two inches more earth. A third course is desirable, but two may do ; a two-inch covering at top finishes the bed. The bed can be finished in five or six weeks, and if under cover, in a moderately warm shed, it will produce in as much more time. The beds so made are, according to the authority we have mentioned, far more certain and more lasting than those made any other way. It is mentioned that the higher the keep of the horses, the better, and that grass-fed horses would yield but few, if any, and not yield any sometimes. These beds become a complete mass of spawn, and last a long time. The old practitioners, in our young days, used to prefer the sweepings of a mill track, when horse-

power was more common than even steam-power is now, and these sweepings, which of course were composed of the droppings of the horses employed, were certain to become mushroom spawn. Dunghills which have lain a long time without turning, are frequently found full of spawn. In fact, the dung of horses, cows, and sheep, may be considered to have the seeds within it, and to want only the proper conditions to set them growing. For the convenience of transporting, a vast quantity of mushroom spawn is manufactured every year, for it has the capacity of keeping unimpaired for years, and of being set growing at any time. By mixing the various droppings of sheep, cows, and horses, together with rotten tan or rotten wood, that has become fine dust, into the consistency of clay, and forcing it into square lumps to dry in the sun, every brick or lump can be made into spawn. When in a certain state of dryness to bear it, three or four holes are made in the middle with a blunt dibble, and when they are quite dry, a little spawn is put into these holes, and they are built into a kind of stack, not quite close to each other, and the temperature raised to sixty or seventy degrees, and the whole mass will become spawn. Some build this stack in sheds, and cover it with hot dung for a time. In three weeks, you may uncover and try one of the bricks, which, on breaking, should be fully charged with whitish thready-looking stuff; then they may be thoroughly dried, and will keep good for years. This spawn may be made twenty different ways, and lumps of it put into a heap of horse droppings would change the whole mass. Upon this principle, mushroom beds are made in every possible form and place, and under any conceivable circumstances. It is scarce worth while, in a gentleman's place, to attempt the working of spawn; it is so cheap at the nurseries that we can get all we want for a trifle, and thus avoid all the mess and trouble. The formation of a mushroom bed is a very simple affair. It may be made a sort of bank with two sloping sides, or against a wall with only one sloping side, at an angle of forty-five degrees, if out of doors, but anything we please if under shelter. There must be a sufficient body to generate a gentle heat; for an effective bed to last some time, heated with horse droppings or any short dung, a bank four feet wide at the bottom, and sloping to a point, say three feet high in the middle. When all settled, thrust a stick into the mass that you may know when there is a genial heat;

break the cakes of spawn into pieces the size of a hen's egg, and tuck them into the sloping side, only put far enough to hold in while you put two inches of mould over them. Some pretend that a portion of the top should be left unmoulded until all danger of too much heat has passed over; but the fact is, that the bed should not be spawned or moulded at all until all danger of over-heating has gone by. Straw may be placed over the whole, and it must be left to time to get into working. Another way of making a bed is to lay the material against the wall under a temporary roof, or under a shed, or in a barn, or at the back of a greenhouse, or vinery, or stove, making one sloping side only; but the process is to be the same.

We have, before this, seen mushroom beds on the floors of all the vineries of an establishment, where the droppings, or short dung, have been laid along the ground in a tolerable heap, and merely patted down with a fork to something like a flat bank. Here they were spawned and covered, and very shortly produced heavy crops; but the theory may be reduced to a rule that is unerring as to the production of mushrooms, in numerous ways. First; horse droppings, or short-dung, with body enough to generate heat, and two inches of mould at the top, will always produce the crop if the spawn be inserted. Consequently, so that it be kept dry, no matter where it is made. Second; horse droppings, or short dung, in too small a quantity to generate heat of itself, will nevertheless produce the mushrooms when spawned, if the temperature of the house be kept up. Consequently, a large pot filled all but two inches with horse-droppings, a lump of spawn put in, and two inches of mould at the top, will yield mushrooms in great plenty if put in a stove. Shelves two feet wide, with a two-inch ledge in front, may be filled as full as possible on a slope with droppings, or short dung, by which means the wall of a shed, or out building, capable of being closed from the weather, may be made to hold several, one above another, two feet distance being enough from one shelf to the other, the moulding and spawning being similar to all other beds; but the temperature ought to be steady, and no draught admitted. This mode of culture in a cellar is very desirable, light being not at all requisite to the production of the mushroom. The principal attention required is, to have the dung of a good genial warmth at the time the

spawn is inserted. After it has begun to work well, all that is necessary is to keep off frost, cold winds, and draught. A covering of clean straw is of great service, and it must not be forgotten that moisture is necessary, though too much of it is mischievous. It has been often attempted to spawn a pasture, and it has occasionally answered in part; but on an occasion when an old and barren mushroom-bed was used as manure on a quarter of a kitchen garden, the production of this valuable esculent was so great as to surprise everybody. It continued productive until the severe weather checked it, and for two years it continued to resume its autumnal crop in perfection. A thick coating of the collected droppings along a few rods by the side of a pasture produced nothing the first season, but yielded fine mushrooms the second year, and continued to do so for years, perhaps till now, for we lost sight of it altogether. Mr. Upright, a gardener in the habit of exhibiting fine vegetables, once exhibited mushrooms in pots, cultivated as we have described, and most extraordinary and crowded specimens some of them were. The fashion of growing on shelves against a wall should always be adopted at the back of a stove, or in any other house that would create a temperature of 55 or 60 degrees, for they would be produced in great plenty at seasons when they would be invaluable. Mushroom-houses have been erected on various plans; but as almost every kind of structure, from a cellar to an attic, from a stove to a shed, can be made available, we should never think of constructing a house on purpose. There is not a cupboard or a corner that may not be appropriated to the culture of this valuable esculent, and it is a shame that any hole or corner should be unproductive.

PROTECTION OF PLANTS IN THE OPEN GROUND.

There are in our English gardens many plants that will, with a little care, brave our English winters; but which, if left to the chances of the weather, altogether perish. Some of the roses which are most beautiful are too tender to stand unprotected; many require the fostering warmth of a south wall, and some even require a distinct covering of some warm kind that shall keep off the severity of some of our frosts. Not a few are tender while young; but when well established will stand tolerably well, although we have had winters and

succeeding springs that have killed our hardy laurels, laurustinus, bay, and aucubas, to the ground. The assistance that can be given while young cannot be afforded to large trees ; and therefore it is fortunate that they require less care as they grow larger, and older, and better established. Roses growing on their own bottoms, and forming beds, are for the most part tender, and are among the most interesting of our garden beauties. Mr. Greenus, of Rickmansworth, once recommended to us his method of protecting these dwarf tender roses ; and we published it in the Garden Almanack. After planting out his roses in the order they are to remain in, he filled up the interstices between the plants with rough white flints, through which the roses made a very pretty feature ; during the winter months he tucked moss between the plants ; and for the season it looked like a bed of moss and flints. In the spring the roses were cut down close, and soon resumed all their wonted beauty. Nothing could be more simple than this. It was evident that the flints and moss together bid defiance to the frost, and that roses which would not have stood the open weather were preserved in good health and strength. The same tender varieties budded on stocks would inevitably perish, if not protected in some way ; and moss is the best medium : let the moss be tucked between the branches, and some be wrapped round the outside, and all be papered or matted over until May, when they may be released, all the weak branches cut away, and the strong ones shortened ; and the bed will be as fine as ever. But there is another way of managing tender roses on stocks : they may be taken up carefully, and be planted in by the heels, in any sheltered spot where litter and a mat may cover a dozen or two heads, and be planted as carefully in the spring ; when they may be staked and pruned, and will be as strong and healthy as if they had never been removed. But they must not be replanted until the spring frosts are done with, because they will grow directly, and the young wood, in such case, must suffer considerably, even if the frost be not sharp enough to kill them altogether. The magnolias, while small, will often suffer ; and if they are grown in pots till they are a tolerable size, they will be two years before the roots lay fairly hold of the new ground ; but it is better to plant them out small, and to cover them with a straw cap, like a beehive, made after a similar plan, but rougher and lighter, because

they look tidy when taken off and placed by their side. This same cover, which can be made to suit any plant of two feet high and under, is the best that can be used for araucarias, choice pinuses, and all other young plants that are tender while young; for the covers are easily packed away one in another, when not wanted. There are many of the hybrid rhododendrons perfectly hardy, sufficiently so to stand any degree of frost; but they bloom so early, that the flowers, which are always tender, are cut off by the spring frosts, and the entire beauty spoiled in a single day. The covers we have mentioned will effectually preserve the flowers; they should, therefore, be put on every night, and may be also used in the heat of the sun, and be kept on in windy or frosty weather. By this means the beauty of the plant may be enjoyed in all but frosty or windy weather; and the covers, if obliged to be left on the ground, only appear like so many beehives. These covers, of all sizes, might be brought into very general use, not only to protect plants from frosts, but also to preserve the flowers of many choice plants on the borders or on lawns, when the bloom is of a nature to be damaged by rough weather, or too much wet; for they are as good a shield from rain as they are from sun and frost and wind. A great number of plants flower well against open walls, and people are generally very careful to mat them, as a preservation from frost; but they make a sad mistake in omitting to mat them when the sun shines hot and bright. It is not the frost that does one half the injury that these plants suffer in winter and spring. The *Camellia japonica* will do admirably against a wall out-of-doors, and will stand even without a covering; but often all the flowers are seen killed in a single night of hard frost—at least all the blooms that are expanded; whereas a mat would have saved them. But two things should be provided for that are seldom noticed: in the first place, a ledge or coping should be so placed that the covering may be fastened under it, so that no vacancy shall appear at top, but all wet shall run off; and, next, that pegs or stops should stick out from the wall, a few inches, to keep the covering from touching the plant. Then, again, there is another point to be attended to; the mat must be placed over them in the hot sun as well as in the cold frost; and the same must be observed in heavy showers, and cold winds, all alike inimical to flowers, and to the young

growth of plants. The *Magnolia purpurea*, *conspicua*, and some others show their flowers very early in the spring, and very frequently have all the expanded blooms killed off by cold winds or frosts. In the open air, and when the plants have attained considerable magnitude, we are obliged to put up with all this ; but when trained against a wall, they may be saved and the plant preserved in all its beauty for many weeks ; and all by means of a covering to put up and take down as required, according to the state of the weather ; but always at evening, because it is impossible to calculate on a single night in March and April without frost. It is a very common thing to plant fuchsias out of doors in beds and patches or in single plants. The winter generally kills them while young, but by covering the roots and part of the stems with moss, they break out early the next year and grow very strong, much more so than if they were new plants put out. This simple covering of moss is one of the greatest protections that can be given to any tender perennial that dies down naturally, or is usually killed down to the ground. Tender bulbs that grow stronger the second or third year of planting, but which are in danger of suffering from frost, may be effectually covered with about two inches of moss ; for no frost will penetrate it ; and, that the wind may not displace it, a few pegs run through the lumps or tufts will be found of the greatest use.

Moss is not so good a protection for small plants, that is to say, in practice ; for, although it is effectual as to cold, it is such a harbour for vermin that the chances are sadly against the plants. They will escape the frost only to be devoured by slugs, snails, and other enemies. A lighter sort of litter, such as well-dried peas haulm or new straw, well broken, will be found better ; or if there be beds, a few hoops put across, with two or three straight laths along them, to prevent the cover from falling through, enables us to throw a cloth of some kind, or some matting over them. This is particularly applicable to pinks, carnations, pansies, choice autumn sown stocks, and the better kind of annuals and perennials raised from seed at the end of the summer. Choice bulbs of all kinds grown in collections are worth their trouble and expense. Choice anemones and ranunculuses, when sown in autumn, want this protection in spring, and we have succeeded in saving a bed of verbenas by matting them in bad

weather through the winter, which, however, was a mild one.

For larger shrubs and trees than we have yet mentioned, the best kind of protection is wicker basket work, made in two halves, to be brought together by putting half on each side the plant, and fastened together with hooks: although it does not keep in all the heat or repel all the cold winds, it is a great preservation, and if it be anything very tender, matting can be put round the wicker work to render it still more close, though we have found it equal to saving the *Agave americana*, which is very succulent and susceptible of injury without any very intense frost. The wicker work can be wove as close and as impervious to weather, or nearly so, as any matting can be found. Curtis, of Moorend, Bristol, recommends his patrons to protect the heads of roses with a kind of cap made of oiled calico, stretched on a wire shape, and to be put on like a man's nightcap, not at going to bed, but for the whole winter season, during which period in fact the tree is at rest. There is no doubt but this is an effectual preservative, but the appearance is against them; although, as he justly observes, they might be painted of a dark colour, that they may not look so conspicuous; others merely tie up the heads pretty close together, and mat them round. Any way they look ugly, therefore we prefer taking them up altogether and putting them in by the heels, where one mat can cover all their heads at once, or tying them up in a mass with bass matting as neatly as possible, and letting them remain in their places. We have been in a garden where the rose stocks were all bound up with hay-bands, but the common brier is one of the most hardy things we have, and can take no harm; it is the budded part only that can be injured by cold. If, however, we are determined to grow the tender roses as standards, they should be in a group that we could accommodate with some kind of covering, in form of a tent, or as dwarfs, where we could protect them with moss; for it does appear ugly to see in a garden a number of standard roses with their heads tied up, and it appears an act of great violence to take them up and replant them every year. It is no uncommon thing to see the front of a house matted up for the sake of something that is under it; but we seriously recommend all tender things to be placed in a compartment by themselves (on a wall, for instance, devoted to such

things), and never to grow them in a conspicuous place like the front of a house. It is generally too much of a job to remove it often, and the consequence is that the poor plant is smothered ; for the putting up is generally managed early, and the taking down late, and the plant has then to bear the vicissitudes of the spring, which are often more trying than the whole winter season.

PROTECTING POTTED PLANTS.

We are not under this head going to treat of those tender plants which belong to the greenhouse or stove, but simply those which may be called half-hardy,—that require some protection in very severe weather, but not much. But many hardy plants in the ordinary ground would be but half-hardy in pots, unless some means were taken to protect the roots. The reason may be made obvious by a little explanation :—frost which would not penetrate one inch into the earth will go through the side of a pot ; consequently the roots of a plant would be frozen, and the most tender parts of a root are the points next the side of the pot. It is therefore a common practice to plunge them in the ground, or in some other medium that shall preserve the sides from the frost. Thus we see in nurseries thousands of plants plunged in their pots and merely protected by a temporary roofing, which plants would inevitably perish if the pots were exposed to the weather, for the temporary covering is of little avail to change the cold of the atmosphere, but it keeps off the wind, and so far saves the foliage, although the frost would assuredly penetrate the sides of the pot, and damage if not kill the plants if they were not plunged in something to their rims. Many plants are only tender while young, and become very hardy when once established in the ground. The magnolias, for instance, may be seen flourishing as standard trees, and of a large size, which are nevertheless kept in pots for stock, and are carefully plunged and covered up while young. Some of our hardiest trees, which stand any degree of frost so far as living and growing well goes, if the spring happens to be forward, and the young growth excited early, are cut off, and the tree has to break forth again with a new set of buds. We frequently see the walnut pushing forth its young branches and its fruit in the spring of the year, and the whole of the

new growth cut off by a spring frost, and the crop destroyed. The plunging of young plants therefore in the common ground keeps the plant from too early a growth, because a few sunny days will not take half the effect while the roots are no warmer than the soil ; but if the sun were giving its influence on the sides of the pot, the roots would be excited, and the plant commence its growth so much the sooner. The first thing therefore to attend to with all potted plants is to plunge them to the rims. This will do a good deal towards protecting them. If, in addition to this, they are shielded from the north-east winds, and hooped or roofed so that they can have mats in severe weather thrown over them, it will be found sufficient protection for camellias, azalea indica, the half-hardy rhododendrons, heaths, epacris, and hard-wooded Botany Bay plants generally. It is true that these things are mostly put into the greenhouse, but there is no occasion for it ; they simply require to be protected against the cutting winds and very severe frosts, and are in most good places preserved in cold brick pits, or plunged as we have described.

Almost all greenhouse plants, if not very succulent, may be protected in brick pits, but pits built with turves are even warmer than brick-work, and one of these would in ordinary weather protect geraniums until the spring, when the great trial of all plants commences, because of their young growth, which is easily damaged by wind and sun. If therefore great attention is paid at this time, that they are exposed to neither when extreme, they will go right through the bad season safely.

Few amateurs are aware that the warm sun of the spring—which we are apt to view with great complacency, and let the plants, as may be thought at the time, enjoy it—does so much mischief as it does, but the effect is to excite plants into growth that are too tender to bear the changes that follow : whereas, if they were as carefully protected from the hot sun as they are from the cold wind, they would be far better. It is a common thing to see plants stand well under a north wall, while those under a south aspect are cut materially. The former do not make an effort to grow, and are safe, while those in the warmer aspect are early upon the move, and suffer severely from the trifling spring frosts. It is the same with plants in pots, and hence the advantage of the roofing,

which can be made to shade them from the sun as well as it protects them from the wind and slight frosts.

The different modes of protecting potted plants are, therefore, first, to plunge their pots to the rim, and let them take their chance of the open weather—this will do for most things that are nearly hardy, and that would be safe, planted in the open ground. Secondly, to do this, and provide hoops and mats to cover them in hard weather, and shade them from the burning sun, which is often felt in the early spring months—this will do for plants yet more tender. Thirdly, to place them in cold pits, built up with turves, to form the walls, and glass lights to cover them—this, with proper attention, will do for many greenhouse plants. Fourthly, to place them in regularly-built brick pits, but with no provision for artificial heat in the event of hard weather, it being quite sufficient to shut out the frost, and shade them from the hot sun. These pits are of various constructions, according to the height of the plants to be protected: camellias, azalea indica, epacris, heaths, and many other plants, are sheltered there by thousands, and except covering with mats, or cloths, have none but the natural warmth, or, rather, the warmth of the earth, which is kept in by means of proper covering, increased in thickness during the hardest weather; and no method that has been devised answers better. Fifthly, we come to pits warmed by artificial means when necessary, and greenhouses, which are only on a large scale; but even these should be rarely heated for ordinary greenhouse plants, for the plants thrive much better without fire than with it. The less excitement a plant has in winter time, the better. Most exotics are used to more uniform climates than our own; they may have even a longer winter than ours to contend with, but when the fine weather comes, they have not the alternations of heat and cold peculiar to our climate, and, therefore, it is these changes that we have to guard against. But, although we have mentioned some of the most common means of protecting potted plants, we must not omit to notice a more rude way of treating them resorted to by those who have not the means to provide a better method. We have seen a hole dug in the highest part of the ground, two feet deep, three feet wide, and as long as the plants would occupy, the plants set in the bottom of this hole, and hurdles placed over them, upon which some sort of covering was put at

night, and taken off in the morning, unless it happened to be frosty, when, of course, it would be kept on ; and we have known even geraniums, which we consider among the most troublesome things to manage, go through the winter well. We could not say much for the colour of the foliage after a hard winter, but they have been cut back pretty freely, and started into growth in the spring, and very soon recovered all the health and vigour of better used plants. Myrtles have hardly suffered at all ; azaleas have lost the most part of their foliage, but a month in the open air and proper attention have restored them a good deal, and one would scarcely think they were the same. Plants in dwelling-houses are generally kept at the windows, and, except in very hard winters, suffer but little ; these will be greatly assisted by removing them to a stand in the middle of the room at night, and keeping them there, if there be much of a frost, as that would be more felt at the windows than in the middle of an apartment.

One great point to be attended to in all cases, whether in the dwelling-house, in pits, covered, plunged, or exposed more, is to give no more water than is absolutely necessary to keep them alive. We do not mean that they are to have but little at a time, for that will destroy the most hardy plants in existence ; but that they are not to be watered oftener than they require it ; and that, when plants are at rest, is very seldom indeed : when they do want it, wet all the soil in the pot, but never give it them a day before they require it. We would rather see a plant flag, as an indication of its wants, than give it a drop a day beforehand ; for when a plant is at rest, it will stand a much greater degree of cold than when growing, and the tendency of watering too much is to excite growth, or, failing in that, to rot the roots, therefore it ought to be avoided ; and the same applies to plants in a greenhouse. When a plant will grow, we must afford proper nourishment, but when at rest, we should encourage the rest rather than excite it to grow. The principal thing to guard against in protecting plants in winter, is damp. A dry atmosphere is not easily provided when we have so much humid weather, but a good deal may be done by covering close on damp cloudy days, and by not crowding too many plants into a small space. Where we have artificial heat, as in a greenhouse, we can occasionally make fires, and by

opening the lights to let the damp exhale, keep a place tolerably dry ; but when we have, as often happens for a long time together, wet and cloudy weather, and hardly any sun, we can only shut it out ; even this must be carefully done, for if plants are shut up too much, they will be forced into growth, and that will cause them to be drawn. Nothing is more conducive to health than plenty of room ; half the plants that are spoiled in a greenhouse, more than half of the long-legged, ugly, uncouth specimens that we see about, are the result of over-crowding. It causes the leaves to fall from the lower part of the plants, the under branches to decay, and the tops to draw up into an ungainly form ; and it is not easy to recover a specimen that has once gone wrong in this direction. Avoid over-crowding them above all things ; rather throw half the plants away, and take care of the rest, than, by cramming too many into a place, spoil all. When it is done, and the forms of the plants destroyed, the only way to recover them is to cut them down very close for the chance of their breaking out at the bottom, or to cut off the side branches, and see if they can be made into well-formed standards ; but it is only a few kinds of plants that make good standards, and we should not be tempted to try the experiment with subjects that will not form good heads. Sometimes, in spite of all our efforts, the frost will lay hold of plants ; when this is the case, syringe them well all over the foliage, and cover them up close, so that the sun shall on no account reach them. In most cases this will thaw them gently and save them, and nothing else can. We have seen a whole pit full of heaths frozen through leaving off the covering, and hanging their young shoots down as if they wanted water. They have been syringed all over their foliage, the lights all closed and closely matted up till the next day, and have been perfectly recovered. Now, although the frost would not have killed them, every shoot would have been lost, if they had been thawed by the sun, or the warm wind. We have seen a bed of tulips that have been frosted not long before they bloomed, and every stalk was doubled over, and the buds hung down ; we have seen them syringed in the same way, and matted up close, and the next day they appeared none the worse for the freezing. We might mention twenty other instances of the efficacy of syringing or watering frozen plants all over the foliage, and covering up close from

wind and sun, and it is the only thing we can recommend when anything has become frosted. The best rules, then, for the preservation of plants in pots are, first, to abstain from watering as much as possible ; second, to give plenty of room ; third, to cover from the hot spring sun as carefully as from the winter frosts ; fourth, to plunge all pots that have to be exposed to the open air, or to slight covering ; fifth, to avoid opening all houses, pits, and frames, on wet and gloomy days, and generally to take pains to keep all plants as much as possible at rest. A little attention to these rules will assist greatly in the preservation of half-hardy and greenhouse plants through very formidable winters, and keep them healthy and ready for a sound spring and summer growth.

MAKING AND MANAGEMENT OF LAWNS.

MAKING A LAWN.—This operation in a garden is very like laying down a carpet in the house. The space must be dug all over, trodden hard, raked even, and rolled. The turves, if properly cut, should be all of a thickness and all of a size, three feet long, one foot broad, and cut as level and as square as possible, otherwise your work will be trebled. You then unroll your turves and begin by laying the first row end to end, to form the outer edge, and continue the next row by pushing the turves close up to the first. If you find any very great inequality in a turf, throw it on one side ; you may make yourself a good deal more work by trying to adjust a bad one, for all your others must follow. When the turves are all laid down, you must get a turf-beater to knock down any inequalities and make the roots press into the soil. If it be very dry weather, use the water-pot freely after beating, so as to fairly saturate the turves, and when the surface has dried enough to let the roller go over it, give it a good rolling with the heaviest iron roller you have, and if the weather continues hot, give the grass a second or third watering, for unless this work be done well, a hot sun might curl every turf. However, the best season for this work is the autumn ; everything works well then ; turf has the benefit of a cooler temperature, and before the winter is over it is firmly rooted and ready for the scythe.

There is no part of the garden that requires more attention than the lawn, because there is no department that sooner

shows the consequences of neglect, or that retains them longer. Let the grass be in every way good, all that we could wish, and let it go a fortnight too long in growing weather unmown, and the roughness may last the greater part of the summer. We need hardly say here that the mower should be one of the best of the workmen, that he should be able to cut very close and very even, leaving no marks of the scythe. To do his work properly, it should be all done while the dew is on the grass, nor should he allow the grass in the growing season to go long together without cutting. As fast as he mows, somebody else should sweep up the cuttings, and remove them, for in hot weather it would change the colour of the grass beneath in a very short time. Before the morning of cutting, the grass should be rolled, and if there be many worm-casts, it should be bush-harrowed or swept with a coarse broom, to spread them about before rolling. If the lawn be inclined to produce moss, sowing wood ashes before the dew is off in the morning three or four times during the season will be of great service, and nothing must be omitted in the way of close cutting, for nothing but that will keep a good bottom. If a lawn has been neglected, and got into hollows and bare places, a coating of road-drift all over it, so as to make the surface perfectly level, will be the only good and quick remedy. Let there be new grass-seeds on all the bare places before the road-drift is put on, because in the raking, rolling, and levelling the coating, the seeds will be sufficiently disturbed to bring plenty near the surface, and in a short time will produce a fine coat of grass of the old and new together, and the surface, being rolled from time to time, will be so levelled, that the grass all over can be cut even and close; in fact, it can be made far better than it ever has been, in consequence of the better level and thinner growth. To keep a lawn in first-rate order, there must be a heavy roller, one equal to the strength of two men, and this should be used after the ground is a little softened by rain, and the grass has got dry again; not that it is necessary the grass should be dry, but that after rain, there should be some twelve or twenty-four hours to let the wet soak down a little.

WORMS.—If worms are too troublesome, give them lime-water, pretty strong; it is better almost to discolour the grass a little while, than to be pestered with worm-casts, for it renders the lawn useless. No ladies can walk where worm-

casts abound much, for they are exceedingly dirty, and stick to the shoes worse than mud. In mowing the operator must not only look to the quality of his scythe and its keen edge, but he must especially see to the setting of the blade: it ought to be so put to the handle that he could, if necessary, rub the back all along the sweep he takes, and the sharp edge be half an inch from the ground the whole sweep, the point being well up—for if that be too near the ground it will now and then, by almost the turn of a straw, stick into it, and at any rate show its marks all the way the man mows. We need hardly say that mowing for lawn work is almost as clean and as exact a job as shaving a beard; there must not be a shade of difference in the length of the grass, the edge must not go nearer to the ground in one place than another, for it will show in different shades, if it be not conspicuous enough to make the false cuts apparent.

MOWING MACHINES.—Of late years, an ingenious mowing machine has been patented, and having worked it ourselves, we can speak favourably of it in use under some circumstances, but there are two or three conditions that must be observed: first, the surface of the ground must be very even; we do not mean that it may not undulate, or that up or down hill makes any great difference, but the operation is performed by revolving knives in a half cylinder, the edge of which is presented to the grass at a given height by means of a roller which goes on the ground and rolls at the same time, another roller being placed some distance before.* It only remains to be mentioned, that for very light work, one man can push the machine before him, and that for up-hill work, or rather heavy jobs, one should pull in front, and the other guide, as in the case of ploughing. The grass is shaved off evenly as far as the rollers and cutters reach, and by continuing this, the operation can be carried on over a great extent of lawn; but we have heard it objected, that when people turn round and cut their way back, it makes the lawn look all striped, every straight cut being distinctly exposed by the back cut laying the grass one way, and the forward cut the other. This trumpery objection is one of the gardener's own coining; for instance, what business has he to cut both ways? why not roll the machine back without cutting? We have worked the

* Mr. Bayd has in his patent removed all objections.

machine many a time ourselves, and there is one advantage which we have not in mowing,—the grass may be wet or dry for the machine, therefore we have the whole day to work in, instead of the first hour or two of daylight. The managers of the Sheffield Botanical Gardens boasted in their report of the saving they should make, and had begun to make, by adopting the use of a mowing machine, so that it has had the test of some years, and unless it were efficacious, a public body managing a garden would certainly not adopt it and boast of its economy.

OF THE TREATMENT OF DIFFERENT SOILS.

We are not prepared to recommend the analysing chemist to test a few sods of ground before we begin to cultivate it, because we hold that for the most part a practical man can estimate the soil as well, by turning it over, and handling it and smelling it, as is at all necessary for the ordinary purposes of farming and gardening. It is as easy to discover whether earth is light and sandy, or heavy and clayey—whether it is fat and rich, or peaty or poor,—as it is to decide on a growing crop; and generally speaking, the productions will show us what the land is without turning it over. The most hungry of all soil is that which is light and sandy, and at the top of a subsoil of gravel. It would seem that all the dung we can put on such land is gone in a season. With land like this, one load of good loam or marl will do more good than two loads of dung; but in preparing dung for such land, the mixture will be beneficial. Let there be, if it be possible to get it, a load of loam under the dung-heap, and when there is a load of dung upon it, another load of loam, and so on alternately. This mixture will be far more enriching than dung alone. A dressing of lime in the autumn will also help it, but as it is the loam or marl that is really wanted to render the earth fertile and profitable, it must be kept in mind that the sooner we can put a quantity in the land, the better; for until it has this, the dung dissolves and washes through the soil, so that one-half is totally lost. In such lands as this, top-dressing is better than digging in, for it has then to wash all through, and the roots get more of it in passing than they would in having to go down after it.

CLAY SOILS.—Clay soils are most troublesome; they are,

in a manner, unmanageable at certain seasons ; generally speaking, they are hard in dry weather, and swampy in wet. No garden roots can do well in clay, without it is ameliorated in a great measure. The best application to clay lands is a mixture of peat-earth and dung. Let the heap be composed of load for load of the peat-earth that is full of half-decomposed vegetable matter, consisting of the strong fibrous roots, and sand and dung ; and this heap, when chopped down and mixed, will be found an excellent dressing. But it will have to be perseveringly applied in considerable quantity to make a clay soil fit for a good kitchen garden or flower garden. We are presuming, too, that there has already been performed on the ground all the draining that is necessary, for the clay land would be altogether unmanageable if it also lay wet. These stiff lands cannot be knocked about and stirred too often, and if any portion is vacant in winter time, it should be left in good high ridges, that the surface may be increased for the frost to act upon. It is also necessary in the management of clay soil to watch for its particular condition for working. If too wet, you can do nothing with it, and if too dry, the lumps can hardly be broken. It is only a short time between wet and dry weather that the soil is at all workable with advantage, in its transition from wet to dry. Such ground cannot be too often forked. Road sand is next in usefulness to peat, if mixed with dung ; but merely adding sand to clay without dung will scarcely render it less adhesive. Generally speaking, the oftener it is dug and forked, or, if in large quantity, ploughed, the better ; for the separation of its particles is absolutely required, and the dung, and sand, and peat, and any lighter medium mixed with it, keep the mass open, instead of allowing it to run together again. On an estate where there were a few acres of common heath soil, as well as some very stiff clay land, carts were kept removing loads of the peaty heath mould to the clay spot, and returning with clay, and the labourers were kept mixing and bruising the clay and peat together for the top eighteen inches, by which means the two otherwise useless, or nearly useless, fields were brought into first-rate cultivation. And although such an operation would be costly, the first cost was the best, because instead of half-crops and no crops at all, some of the finest crops on the estate were the immediate result. There are some applica-

tions good to land of all sorts ; such as all vegetable mould, and even green vegetables, wood ashes, or ashes of the burnt weeds and waste of a garden ; cow, horse, sheep, and rabbits' dung. These matters are rarely given in excess, for it is natural to the earth to receive the dung of animals, and it is almost impossible to hurt anything by excess ; whereas of unnatural or artificial manure it would be very easy to do mischief. It may, however, be concluded that the ground must be got to a proper texture before we can do much good with it. If stiff, by lightening it ; if light and sandy, by marling it ; if wet and swampy, by draining it ; for independently of the nourishment it may contain, in soil too light it washes away, in soil too heavy the plants cannot take all the advantage of it ; besides which, the unpleasantness of digging, hoeing, trenching, raking, planting, and indeed every operation connected with its culture, renders all the labour double, and the benefit derived from it only half what it should be. These general directions for light and stiff lands will do all that is wanted for ordinary gardens.

GROWING PLANTS IN POTS.

It would be an endless task to point out the numerous advantages of growing certain plants in pots ; but some of the chief may be mentioned, because they affect so much of our design in practical gardening.

First, then, we may mention the opportunity it gives us to remove them at pleasure from one place to another, whether it be to change the temperature or treatment, or to exhibit them at a distance, or to place them in situations to bloom, or to exchange those past their prime for others just coming to perfection, or to rest them when not wanted to grow, or urge them when we desire to force them on.

Secondly, it enables us to imitate any kind of soil adapted to their different natures, although they may be growing all in one place.

Thirdly, it gives us the option of starving them, to check their exuberance, by giving them less water and stinting them for room, or exciting them by giving plenty of both soil and moisture.

Fourthly, it affords every facility for examining the roots,

when there is anything in their appearance that excites our curiosity or demands a remedy.

We might go on *ad infinitum* with the list of advantages which pot-culture confers on the gardener, to say nothing of the millions that are grown for sale in their pots, and could not be sold without them; nor of the increased value of even hardy plants that are kept in pots for the express purpose of planting out at almost any age, without detriment to their future progress. The proper study of plant-growing in pots is therefore necessary to everybody who desires to be master of his business or profession. The various departments for plants in pots are, the cold-frame, the greenhouse, the forcing-house, the stove, the conservatory; and in all these there are certain rules common to everything, as well as other rules peculiar to the department to which each may belong; and we shall devote our remarks first to those common to all. The most important, then, is—

DRAINAGE.—This is the most important of all matters connected with pot-culture. All pots have holes to let off the superabundant moisture; but if we contented ourselves with filling a pot with soil, it would constantly wash through these holes, and thus leave the roots hollow and unsupported; or if it could not get away, by reason of the shelf or bottom on which it was placed, it would stop the holes altogether, and convert the wholesome soil into a hard impervious cake, or, while wet, a muddy mass. Therefore there should be, first, a piece of broken pot over the hole, not fitting close, and above this a quantity of other broken pieces of pot, or charcoal, or some other coarse rough stuff, filling one-fourth of the pot in height, the top portion of these broken pots being smaller than the others. The soil would then give out its moisture all over alike, instead of being washed to the single outlet, and this moisture could run through the drainage, as it is called, without taking any of the soil with it. Thus the soil may be kept compact for a long period, and never be soddened, as would be the case if the hole were stopped.

Now those tens of thousands of pots in which ten-week stocks, mignonette, and other plants, merely grown a few months, to be marketed, are kept, do not require so much precaution; nor do any plants intended for bedding out before they attain any age or size in their confinement. For instance, all struck cuttings, merely potted for storing, only require a

piece of "crock," as these broken pieces of pot are called, placed over the hole, and the rest of the pot may be filled with the soil. They are perhaps struck by thousands in the autumn, and potted when struck, merely to store them through the bad weather. In the spring they are turned out into beds, or sold to those who prefer buying to the trouble and inconvenience of propagating. But if plants are to be grown to perfection in pots, drainage is the most important part of the operation, and if it be not well attended to, a majority of the plants will soon become unhealthy, whether they be hardy, half-hardy, greenhouse, or stove kinds.

SOIL AND COMPOSTS.—This is necessarily varied according to the plants; but there are some points even in the management of this that require attention to all. It must not be adhesive, but whether rich or poor, it must be sufficiently open—that is to say, porous—to let water pass freely through it; otherwise it will be impossible to moisten it all alike, and therefore the nourishment would not be equally afforded to all the fine roots that require to be fed. A soil which is naturally sufficiently porous to allow the moisture to go freely through it, may, by sifting it through a fine sieve, to deprive it of the stones and fibrous matter it contained, become much too binding for plants; sifting, therefore, is never advantageous, unless there be too many large stones, and when there are too many, the sieve should be large enough to let everything through that is as large as a marble, for small pots, and as large as a walnut for those of a greater size. Sifted earth will run close together like mud, and will become so compact that roots can hardly penetrate it after a time; and when this is the case, the plant dwindles and often dies. We may, indeed, mix up a compost that would let wet through, however fine it was sifted, but this would not have sufficient heart in it. Sand, for instance, would allow water to pass freely, when once damped all through, but it has no heart at all; consequently, the more sand we mix with soil the poorer it will become; but natural soil, with its proper portion of stones, half decomposed fibres, and bits of half rotted wood, may require no sand or weakening mixture, and yet allow the moisture a free passage, while if the same were sifted through a moderately fine sieve, it would run into a cake, excluding the air, which is so essential to the roots of plants as well as the plant itself, and thus deprive it of the very element of all

others to promote its free and healthy development. It may be, therefore, set down as a most important rule, that nothing so small as a good sized filbert-nut should be stopped by a sieve, and that even the lumps of various kinds and fibres, left in such a sieve as will let the size of a nut through, should be rubbed on the bottom so long as any could be pushed through. Many only pick out the larger stones, and do not sift at all; but the operation of sifting is good, for if we watch the stuff, almost every grub is exposed, so that it may be picked out; and there is always some kind of rubbish that would interrupt us in potting, when pots up to six inches diameter are used. For pots of a large size, nothing so small as a walnut should be stopped—we mean a walnut of the ordinary kind, with the green shell off. The coarse stuff stopped by the sieve makes a very good upper surface for the drainage, and is therefore always of use. The rubbing of it through the sieve breaks adhesive lumps, and drives through fibrous matter that will be always valuable in the soil, though if in matted lumps it would be in the way.

The most valuable soil, as a general stock, is that from the surface of a good pasture, cut not more than three inches thick, and piled up to rot. After a year or two, this kind of soil is invaluable; it is at least half vegetable matter, which affords the best of nourishment, and, generally speaking, the other is a wholesome friable loam. No soil requires sifting more than this, to break the matted lumps and expose the grubs—with which it too often abounds—as each sieve-full is spread in the operation on the heap. It is always worth while to set three at this job, if there is much of it; one to chop the heap down in thin slices, as it were, and fill the sieve; a second to sift and rub it through; and a third to pick out wire-worms, grubs and insects of any kind, as they fall from the sieve.

Another valuable soil is the top spit from a peat common, a soil naturally poor and porous, matted together firmly, composed of half-decayed vegetable fibre and sand, excellent to mix in compost for all plants with extremely fine fibrous roots, such as heaths, Botany Bay or Cape plants, and all others requiring open light soil. This should also be chopped small and rubbed through a sieve. If the lumps of fibrous matter be only chopped small enough to go through the proper sieve, it would not matter if it were no smaller.

Heaths will thrive on this almost alone, and as a poor soil which absorbs a great deal of moisture, it is adapted for everything that does not want luxurious growth, but we only mention it as an ingredient in almost all composts.

Neat's dung, dried and rotted into mould, horse-dung, poultry dung, deer, sheep, rabbits', and even pigs' dung, kept free from extraneous matter and rubbish, are all valuable, and should be saved distinct and separate from each other; and the rotting and preparation of all these will be promoted greatly by frequent turning, so that a new surface is exposed to the weather each time. Sand also should be provided,—clear river sand free from salts of any kind, or silver sand; it is useful to temper any kind of compost, and though not to be used as a matter of course, will often be valuable.

Broken pots are of great service in pot culture, and if every soil we use had a fourth or a fifth portion of small lumps in it, they would do no harm, but in many cases would be highly beneficial; therefore these should be broken into all sorts of pieces with a hammer and sifted into their various sizes, the smallest of all for mixing, the size of nuts for small draining, and two other larger sizes for other larger pots. The potsherds or crocks thus prepared take less room, look more tidy, and are ready for immediate use when they are wanted. Charcoal is also a most useful ingredient. It is one of those materials which cannot do mischief even in excess. It is an excellent thing for drainage, broken into various sizes; and the small is good in every kind of compost, though not absolutely necessary. Brick rubbish is not without its uses, especially for some kinds of rock plants; but we shall treat of the mixtures more generally when we come to the management of different kinds of plants. It may, however, be taken as a general rule, that nothing flowers so well in a finely sifted soil as in a moderately coarse one; and that but for the inconvenience of large lumps in small pots, sifting would be a superfluous labour.

WATERING.—Plants in pots are in danger from the extremes of a want of moisture and excess of it. The former starves them; the latter kills them as surely, but not so quickly. Some persons assimilate the treatment of plants in pots as nearly as they can to that of plants in the open ground; but this is wrong, inasmuch as the circumstances very materially differ. In the first place, the spongioles, or the ends of the

fibres, are protected in the earth by the surrounding soil, and the sun and wind cannot affect them unless they can bake the soil down as low as they reach ; whereas in a pot, both sun and wind affect the sides of the pot, where all the ends of the fibres lie. Next, the roots in the open ground can and do travel down after moisture, which, by capillary attraction, is brought up to meet them, and in fact comes past them to the very surface, and is constantly going off by evaporation ; consequently, every sprinkle of rain that wets the surface supplies the evaporation, if it does nothing else, and the moisture below is spared to a certain degree, and the plant is benefited even by the slightest shower. Now the plant in a pot has no moisture to meet, no capillary attraction can supply it from below ; so that if the soil be sprinkled in imitation of a slight shower, which goes half an inch down the soil, it is not benefited at all. The pots repeatedly sprinkled will be gradually sinking for want of moisture below, while the top half-inch or inch may be kept constantly damp.

We have seen—and it was a practical lesson to us which we shall never forget—a whole collection of heaths that had been starved into bad health by constant and attentive slight waterings ; and on turning out plant after plant, showed the astonished amateur that he had only watered the top half-inch or inch of soil, while all below it was perfectly dry, and a great part of the fibres perished. Let it never be forgotten, therefore, that when a plant in a pot is to be watered, the entire soil in the pot must be moistened, and that it is not to be watered again while the soil is damp enough to feed the roots. In winter time, therefore, plants in a cold frame may go a month sometimes without watering, and not be in so much distress as they would be in summer time in four-and-twenty hours after they had been attended to. It ought, therefore, to be borne in mind, that when the directions for cultivating anything in a pot enjoin the grower to “give but little water,” to “be sparing of water,”—or we are warned that a plant must have “slight waterings,” all these directions must be taken in a very different sense to that in which most amateurs receive them. Slight waterings are destructive ; be cautious that plants are not watered too often ; but when they are watered, every grain of soil in the pot is to be wetted, for they have no aid from the soil of the garden ; their roots cannot feed themselves unless they protrude through the

drainage hole of the pot ; and such is the disposition of the root to feed itself, that they will do this at all times whenever they have a chance and the supply within the pot is at all limited. They will grow to the ground long before the pot is full of roots, if they are stinted of water above.

We hardly know any one operation so generally misunderstood among people who really love flowers for their own sakes, and expend large sums to gratify their taste ; they indulge in "slight waterings" until their favourites decay, and the owner wonders how it is they will not thrive. No matter, therefore, whether pots are in a dwelling-house, a greenhouse, a common frame, a stove, or a conservatory, they must never have slight or half waterings ; better leave them alone until they, by flagging at the points of the shoots, indicate thirst, and then water them thoroughly, than continue dabbling with them with such drops as will only wet the top of the soil, and leave them actually perishing below the deceptive wet surface. We cannot, in fact, tell whether a plant requires water by the moisture at top, unless when it was last refreshed the entire soil was moistened.

THE ROOM REQUIRED FOR A PLANT.—One more rule is applicable to pots of all kinds and in all situations. If we require a plant to grow fast, it must always have plenty of room : if we desire to starve or check it, we must keep it confined. This enables us to regulate the growth of anything ; all we have to study is the kind of progress we require. There is no difficulty in growing plants rapidly ; but we have to study the nature and habits we have to deal with. Those who grow for sale try to grow everything fast ; others, who grow for beauty, must recollect that the faster a plant grows the longer are the joints, the further apart are the leaves and branches, the more bare are the stems, and at the greater distance will the flowers be placed.

Fuchsias are very badly grown by nine cultivators of every ten ; and the public exhibitions are sadly disfigured by long gawky plants, hardly able to sustain themselves, with a succession of bare stems and flowers wide apart, and no more richness of foliage than a badly forced lilac ; and all this because in books and papers they have been taught to grow them fast. We have even seen large plants exhibited with an assurance placed on them that they were cuttings at a given date. But the fuchsia is a plant which should be grown

as slowly as possible to be kept in good health ; it should be kept in constant check, for it is naturally of rapid growth. However, this is not the place to teach the mode of cultivating ; but it is one of those points by which we wished to exemplify the advantage of growing in pots, and especially of the power it gives us to check the advance of anything.

When we desire to retard a plant, it should be confined in a small pot, independently of any difference we make in the soil. When we wish to excite a plant, we should change the pot as soon as the fibres reach the side and they begin to run round it, because every fresh supply of the soil gives fresh vigour. The rule therefore is unerring, independent of everything else, although we have also the means of giving increased effect by poorer or richer soil.

POTTING.—The various states in which plants come to hand require that we should be prepared with plans to meet all circumstances ; but in this particular place we only provide for potting those which have not been in pots before ; and these will comprise,—first, cuttings which have struck root ; second, seedlings ; and, third, plants of a larger kind, which are potted of all sizes required for forcing, or blooming in pots without forcing, for the convenience of moving about.

First, then, cuttings which have struck. These are necessarily put first of all into small-sized pots, say two-and-a-half to three inches over at the top. If these are not to remain very long in their first pots, a bit of moss at the bottom will do for drainage as well as a piece of broken pot, but as the latter is often to be had, it is more generally used. Let the mould or compost be filled in highest in the middle, like a cone, the top of which may be even with the top edge of the pot ; raise the cuttings with a flat piece of wood formed like the blade of a knife, but thinner, raising them clean out of the ground, the pot, or the pan, a few at a time. They have to be carefully treated, so that the roots, which are always tender, be not broken by the operation ; hold the root on the top of the cone, so as to spread the fibres ; put a little soil on the root, and press the plant down to its place, which is so that the upper part of the root is but just covered, for many plants are all the worse for being placed with the root much below the surface. The tender roots must not be pressed hard, as they would be injured, and the watering settles the roots and the soil together very well. This treatment will suit any plant,

but there are some which will strike all the way up the stems if they are planted deep, such as geraniums, which would root at every joint, and many other subjects which strike freely. But all hard-wooded plants, such as heaths and many of the Cape shrubs, would be seriously damaged, and perhaps speedily killed, were they what is called planted deep.

With regard to growing geraniums, which are struck from cuttings of all sizes, and wood of all ages; they are frequently propagated from such waste pieces that they perhaps break, or shoot at the top of a long ugly piece of wood, and it is a common practice to pot these as deep as possible, to bring down the growing part of the plant to the surface of the soil, which, when the pot is completed with its plant, should be as much below the top of the pot as the rim of the pot comes down outside. But geraniums, and other freely-rooting plants which strike at every point, are the exceptions; and even they ought to be cut and struck so that they may be potted like anything else, with the top of the roots just below the surface of the soil.

The next we consider will be the seedling plants. Now, whether these be hardy or otherwise, the potting must be done the same. Fill the pots in the same way like a cone; spread the roots round the sides, put soil on the top and press it down to the right height, for then you have only to thrust the soil down a little round the sides, and not press the plant any lower; but the earth must not be rammed hard, for the young roots must be able to penetrate without difficulty. These, like the rooted cuttings, will require to be watered to settle the soil among the roots. We need hardly say, that whether these be greenhouse plants or hardy annuals, whether they are to be raised or grown in a frame, or in the open air, or in either the greenhouses or other houses, the plan of potting must in all cases be the same.

We now come to larger plants that are to be potted up from the ground—American plants, roses, flowering shrubs of all kinds, perennials, or other large plants. The first point is, the proper size of the pot. It should be large enough to allow of the root being well imbedded in, and surrounded by the compost it is to grow in. The removal of the plant from the ground must be accomplished without breaking the fibres. The drainage of the pot must be attended to as we have directed; there must be as much soil put on as the root will

reach down to, bearing in mind that when the fibres are spread, and the plant rests on the soil before filling up, the collar of the specimen, whatever it be, should be just even with the top of the pot, so that when the earth is filled in, the plant pressed down, and the surface regulated, the roots may be just covered at the collar of the plant; the fibres will be of course further down the pot in a sloping direction. If these plants are cramped for room, they cannot thrive; they may bloom, they may live afterwards, but they cannot possibly keep up any healthy growth, unless they have room and soil to spread their roots in. Many American shrubs come out of peat soil with a great lump or ball of the earth to them. There must be room for this when it is reduced to a moderate size and form; but it must not be so far lessened as to trench upon the ends of the roots, for if these be damaged, they will just carry the flower perhaps, and then go back instead of advance. It requires great care to fill up the vacancies between these balls of earth and a pot, which is very difficult if the ball be too large for the pot; and there are many other evils which result from the imperfect potting of these peat plants. The peat earth which should be used to fill up these pots should be pushed in close all round, every crevice should be filled up, and that pretty tightly, or the water given to them would run through the new peat and not penetrate the old ball.

POTTING BULBS.—The immense variety of bulbs which are annually imported to this country from Holland and the Cape, render it necessary to offer a few words on potting them. For although many are grown every year in pots, few are grown as they should be. All the sorts which require planting in the ground with a good covering of soil, want the same usage in a pot. The bulb should be covered, the pot should be deep without being wide in proportion; for although it is possible to grow hyacinths in a two-and-a-half inch pot, it is not to be compared to the same flower when grown in a pot of six inches.

Pots have been made at some potteries on purpose for bulbs, and when the bulbs are first inserted, they should be covered three inches with the soil they are to grow in. Narcissus, tulips, and many other hardy bulbs, are always the better for covering up, and it may be taken as a general rule that all hardy bulbs are so.

Those which are cultivated in stoves are frequently left

above the soil. Cyclamen, gloxinia, achimenes, amaryllis, and some others, are habitually grown on the surface, or at least partly exposed ; but it is by no means determined that they are the better for exposure ; though, to look at some of their growths, it would be hazardous to say they are worse for it. The principal thing to attend to is the size of the pot and the quality of the soil, which, in a general way, is always used rich and light. The bulbs must be buried, all but just the upper surface, which may be even with the soil.

SHIFTING FROM ONE POT TO ANOTHER.—This should always be done with great care and circumspection. The roots should not be allowed to get matted before they are shifted, unless it is absolutely required that the plants should be checked. Supposing plants to have been in small pots until they are nearly filled with roots, and you choose the plants to be grown well, get pots just so much larger as will enable you to fill the vacancy between the ball and the side of the pot with the same compost it is grown in, and without any more sifting than it has had already ; consequently you must have room enough to drop in a nut all round, otherwise the small lumps on the soil would not go down, and the sides would be hollow. This would leave the fibres that are outside the ball without any nourishment, and throw the plant into bad health, if it did not altogether spoil it. The ball should then be gently tapped out of the old pot, and the drainage of the new one having been provided, put in so much soil, highest in the middle, as will sustain the ball so that it may be pressed down to the proper height, which is easily done when the soil in the pot is conical, because it gives way to the pressure : and when the plant is at its proper height in the pot, which must not be any deeper than it was in the lesser one, put on the soil all round so as to fill up to the surface, poking it down carefully with the finger-ends, or a piece of wood selected or cut on purpose ; not ramming it down hard, but pressing it as much as the original is pressed, that it may all resist or absorb water alike ; for be it remembered that it is impossible to grow a plant well if the ball be hard and the soil put round be soft, or the ball be soft and the soil round it hard. In the one case the ball obtains no wet, because it runs through the surrounding soil too quickly ; in the other, the ball is within walls, as it were, that resist the wet, and the water that is given to it cannot get away.

If the old draining breaks away when the ball comes out of the pot, it is of no consequence ; but if it comes all away together, do not yourself disturb it ; great care must therefore be taken to make, as nearly as it may be, the new soil about as hard as the old, and not more so. Again, it is absolutely necessary that the new soil be the same as the old, unless it is intended to wash out the old soil altogether, and grow a plant in new.

The shifting of a plant that has been neglected and become pot-bound, and the roots matted into a hard mass, is attended with some difficulty. It has first to be soaked in water until the whole of the soil can be washed out, and the roots must be disentangled as well as possible, and whatever are damaged in the attempt must be removed. If the damage is to any extent, the plant must be pruned in accordingly, to diminish the demand made upon the roots. The plant should then be potted like any of those which are potted for the first time ; that is, the roots should be spread all round, as well as they can be, in a much larger space than they occupied before ; and, if this be well managed, the plant will go on with fresh vigour and make healthy growth ; but if we leave this shifting until the plant looks sickly, it may be too far gone to bear the operation. The principal object, however, is to get rid of the sour soil by washing it out, to remove all the roots that have perished, to open out the healthy ones, if there be any, and let them occupy twice the space in a new pot, with good soil between them all, so that any healthy portions may send out new fibres to supply the deficiencies of those lost.

GENERAL MANAGEMENT.—One of the most prolific sources of mischief is the crowding of too many plants into a given space ; yet thousands (though this is saying a good deal) fall into the error. We rarely go into a private greenhouse without seeing twice as many plants as ought to be there, and never without seeing those most formidable enemies, the damp and mildew, at work upon some one or more plants. We need not say that the more moist earth there is in a confined place, the more damp must prevail. Remember that every time you distribute a few pails full of water, you are giving so much to the atmosphere within the house, because the work of evaporation begins directly ; and if the space be not large enough to hold it in harmless vapour, it must condense

on everything that will not absorb, whence it always keeps the atmosphere saturated, a state of things perfectly dangerous to human beings, and highly detrimental to plants. One of our constant cares has been to give plenty of room. We do not, perhaps, put one half as many plants into a given space as the majority of growers, but we are not plagued with damp.

Another point worthy of great attention, is to keep all plant houses very clean ; and leaves and litter of any kind are bad ; they engender vermin, and canker, and mildew ; they exhale noxious gases, and send poison through the air. This is bad enough out of doors, but, confined, it is beyond measure mischievous. The floors of pits and houses should be paved or slated ; for, when the superabundant water from the pots soaks into the common earth, which is the bottom of too many houses, pits, frames, and other constructions, it is constantly filling the confined air with all the moisture it can hold. We are quite aware that all this may seem more cautious than necessary, because all the summer time it works no mischief ; but it is because the place is open to the common atmosphere, and if there were a flood at the bottom it would go off without damage ; but look at the difference when doors and windows are shut to keep out frost and cold winds :—let us now only talk of the effects.

AIR AND VENTILATION.—How many people can look around their crowded houses and find, on examination, plant after plant mildewing in some parts, and losing their beauty as specimens ! The only antidote to damp is air and plenty of it, with all the light we can get. There should be as much room between every two plants as would allow of another being placed there ; then the air can get at them all ; there is only one half the damp created, and that will not saturate the surrounding atmosphere. Perhaps some may think we are depriving them of half the advantages of a greenhouse by requiring them to grow half their plants ; and they may also say they have grown them as thick as they could stick them, and yet not suffered. This may be true ; some winters are so open that the houses have not to be closed four-and-twenty hours together ; but a different result would be seen if they were closed for a week or ten days at a time, as in many winters they are compelled to be. We have seen whole pits of bedding plants, well struck, very strong, and in the best

nealth, damp off in a week ; but we have known the same pits, under the same gardener, without a failure among them all. There is no controverting the fact, that damp is for the most part caused by excessive numbers confined in a given space, when half the quantity would often escape free.

All potted plants should receive as much air as the nature of their constitution will admit. They must not be subjected to a colder climate than they want, for there is always mischief in that ; but we are more apt to be deceived with hardy plants in pots than we are with those requiring shelter. Hardy plants, so called, become only half-hardy when in pots, unless the pots are plunged ; for though frost, even a hard one, will have no effect on many border perennials in the ground, simply on account of the plant above standing it well, and the under points of its roots being out of its reach, yet the same plant in a pot would have the points of its roots within the full operation of the enemy—in fact, the most tender points are close to the side of the pot, which is frozen through in a very short time. On this account, therefore, some of our most hardy perennials, which stand any kind of weather in the open ground, must, when potted, be preserved in frames, or be plunged to the rim in the ground. Hundreds of plants that will bear any ordinary cold above ground, cannot stand the freezing of their tender roots. Again, all potted plants in summer time want a good deal of care when the pots are exposed to the wind and sun and rain ; and, though it is going away from the subject to offer a word on watering, we ought to caution everybody against the neglect of a particular, though often overlooked, fact. In a long rainy season, nobody thinks of watering plants standing out of doors ; and yet there will be found many so bushy as to throw off any quantity of rain, and thereby starve themselves ; so that we cannot be too careful in frequent examinations, whenever we have many plants in pots. Wherever we place them in summer time, the bottom should be hard ; whether of tiles, slates, stones, or bricks, concrete, or any other material, it should be impervious to worms and roots, otherwise the one will fill the pot, much to the detriment of the plant, and the roots will penetrate so, that, when the plants have to be removed, they will lose all the youngest and best portion of their roots. Many form a hard foundation of ashes ; but this is only a partial remedy, and for only a short time ; as soon

as they get saturated with wet, the worms pass through with impunity, and roots will take hold as freely as in earth.

The bottoms of frames should also be impervious to wet, as well as to worms and roots; and all extra moisture which runs through the pots should run off in gutters, or by means of the bottom being on a slope. If the bottom be gravel, or ashes, or earth, or even brick-rubbish, it will absorb the moisture, which, when confined, will saturate the air within, and bring mildew on the plants. It has been said that this is catching, and if two or three plants show it, they should be removed at once. This is all a mistake; the mildew will attack and show itself first on the weakest plants, but it will affect them all if they are all left to the cause, and the cause remains undiminished. It often happens, however, that open weather removes the cause before the strongest are attacked; and therefore the plague is not in such cases quite fatal. This will give a tolerable general outline of the system of growing plants in pots.

FORCING FLOWERS AND PLANTS.

All plants intended to be forced must be first well established in pots. Whether it be a shrub or a pink, the principle is the same; unless the roots feel at home, and are, in fact, used to the soil they are in before they develop their bloom-stems, weakness if not blindness must follow. The first thing, therefore, to look after and secure is, to pot whatever is intended for forcing at the earliest possible period that it is practicable. Pinks, for instance, as soon as they are rooted in the piping-bed; all other flowers produced annually from cuttings, as soon as such cuttings are rooted. Pansies are like pinks in respect to wanting annual renewing by cuttings; for the old plants degenerate: so would carnations and picotees. Flowers that are produced annually from seed should be sown at such time as will produce the plant at maturity about the time that the flowers are wanted. Most annuals should be sown about August, to be forced into bloom at Christmas, or any reasonable time after; because, when once up and strong, they are to be kept from frost and no more, until they are wanted to flower; and the same sowing may, by this means, be available for two or three months, by putting in a few at a time into the forcing-house at the

season suitable for our purpose. Stocks, convolvulus, coreopsis, nemophila, sweet-peas, mignonette, and such like, when once up and thinned in their several pots, can be kept in a cold frame all the autumn, and removed, a few at a time, into the warmth ; by which means, for the purpose of decorating a conservatory, they could be provided in flower before Christmas, and be continued in succession for many weeks afterwards.

American plants, such as rhododendrons, azaleas, andromedas, kalmias, and such like, Persian and Siberian lilacs, Deutzia scabra, Gueldres rose, almonds, double-flowering cherries and peaches, Pyrus spectabilis, honeysuckles, and many other subjects that bloom in a dwarf state, should always be potted the season before, if possible, and be plunged during the first season ; but Americans can be taken up with such a ball of peat to them that they might actually be forced without a pot at all ; and we are not to lose sight of another fact, that it is possible to remove many things without damaging a fibre ; and therefore these things should with great care be taken up the same autumn that they are to be forced. We only speak of ordinary removing, when we say that the flowers will be weaker if they are potted the same season they are forced. Roses cannot be so well managed in a single season ; they will not force so well the first season as the second, however well they may be managed ; and they ought to go through the ordeal of forcing the first season, and all the buds, as they appear, be taken off ; the wood also should be ripened in the forcing-house, or at least kept there until the natural climate out of doors is as forward as that in the house.

Suppose us, then, in possession of dwarf and other plants, flowers, and all the subjects intended to be forced, they should be all placed in a brick pit, or frames capable of being well protected against frost, as early as the beginning of September. The flowers will take no more harm than the shrubs ; all they require is to be kept from damp and frost, and to have all the air they can when it is fine weather. From these stores we have to draw from time to time such as we desire to forward. The forcing-house should have a command of heat from forty-five to sixty, and it should always be from five to ten degrees lower at night than by day. Ten degrees of difference is better than five, because the great evil to contend with in forcing plants and flowers is their growth in the dark ; all

they grow in the dark, grows without thickening the stem, and this evil is so completely one of degree, that everything grows weaker even in cloudy weather than it does in bright. The necessity then of keeping down the temperature at night must be obvious ; yet, in fifty out of sixty forcing-houses that we have been in, the register has actually been higher at night than it has been by daylight. What is the consequence ? That all the forced plants and flowers brought into market are weakly, and many could not, without unnatural supports, maintain themselves in a slightly condition. This particular point has never been half enforced in the treating of nurseries, nor has it been well stated in the numerous publications that profess to guide us in the science of gardening. We, therefore, repeat the lesson, that it may be well remembered. We do not want plants in a forcing-house to grow in the dark, because the stems grow longer without enlarging ; and the only way to prevent this is, to keep down the temperature at night. In cloudy weather, too, it is desirable to keep the house much cooler than in bright weather, because the evil is felt in a less degree ; but still it is felt in the working of the plants, flower stems, and general habit. Roses are more forced now than ever they were, from the fact of the societies giving prizes for roses in pots in the May and June meetings ; but we see many of them so ridiculously weak, that as many as twenty or thirty sticks are necessarily employed to keep the branches from dropping all over the pots. It would be well, therefore, if people who have much to do with forcing would bear in mind, that if they could altogether check the growth of a plant by night, it would be well. Those who are in the habit of shading theirs in bloom can testify that even this partial abstraction of light draws the plant ; and as this is only when the sun is out and very bright, unfortunately they cannot keep down the temperature even if they would, except so far as the shading keeps off the direct heat-rays of the sun.

Some forcing-houses are constructed, or rather heated, on a principle which makes one end warmer than the other ; but those who lay themselves open to the forcing business should have two houses, one like a greenhouse, the other warmed up to the temperature necessary ; all things should go into the greenhouse first for a few days, and then be taken into the forcing-house. Roses, which have always been considered the most difficult, should be potted in the autumn, be placed

in the cold frame till October, be removed to the greenhouse temperature till November, and then removed to the forcing-house, being at a temperature of forty-five by night, or even fifty; and fifty-five to sixty, or, with sun, sixty-five in the day,—beyond this it ought not to be allowed to get. When the roses put forth their branches, remove all but those growing in a good direction for the head of the following year; and as soon as the buds are seen anywhere, let them be taken off, as they only retard the growth of the wood. Continue them in the house to make all their growth, and keep taking off their buds. The wood will perfect itself in the course of the winter; and when the warm spring months come, they may be taken away, be re-potted in larger-sized pots and plunged into the ground, with a proper support to keep them from injury by winds. These plants will have ripened their wood much earlier than the roses bloomed out of doors, and will, therefore, be so much the sooner ready to start again. When, therefore, they are put into the greenhouse in the early part of September, they will be half inclined to start without heat; because they will have had their full period of rest, and will naturally want to grow. Thus the growth which required a good deal of forcing, and a long period of heat the previous year, will be almost spontaneous the second, and a much less heat will do, or if the same heat, not of so long continuance. We have, however, besides the advantage of easier forcing, better forcing; the plants will not want so much heat nor want it so long, so that the growth will be stronger.

Before, however, we place the roses in the greenhouse, we have to prune them, as we would out-of-door roses in the early spring; regard must be had to the shape of the head, the number of branches we require, and where we want them. Cutting back to one, two, or, three eyes, according to the number of branches we want, must be attended to at once, before they are allowed to shoot at all; because the vigour of the plant would be wasted in the buds we intended to remove. This second year, therefore, the roses will be a better form, as well as stronger in their growth. As soon as the roses indicate the presence of the aphus, let the house be closed and fumigated with tobacco; there is nothing else that will effectually remove or destroy them. And when the buds are bursting, the plants may be removed to the conservatory,

though if the conservatory be not a warm one, roses taken from the forcing-house will be found as tender as exotics. If, therefore, the conservatory be really a cold one, let the roses be removed first to the greenhouse as an intermediate seasoning. By removing them from the forcing-house before the buds actually open into bloom, they will last much better, and suffer less than they would if removed in full flower.

We have here only mentioned or referred to the leading summer and hybrid roses ; but many of the China kind may be kept in bloom pretty well all the year without any forcing. We have been more particular about roses, because there is scarcely a shrub, or flower, or plant, that will not do without any trouble beyond removing from the pots into the greenhouse at the proper time, and thence into the same house that roses are forced in.

The forcing of flowers and shrubs may begin in September, because the frosts in that month do mischief if anything at all tender is left out of doors. Therefore, the preparation by getting everything into frames in the early part of September is necessary, and some of each or all the sorts may be removed once a fortnight, according to the number wanted, and these will keep up a succession of flowers, as far as flowers and shrubs of the ordinary kind are concerned ; but there is a great source of flowers among bulbs, which will of themselves keep up a bloom all the winter, or nearly so, beginning with the scillas, snowdrops, early tulips, hyacinths, and continuing with the iris, narcissus, jonquils, amaryllis, and lilioms. Many others may be worth cultivating too, but all these will force. The whole of these may be potted as soon as the bulbs and tubers can be got into good condition ; and the whole of them may be potted and put into the dark in August, in a shady place where coolness is an object, and in all these cases the soil above the crown of the bulbs should be exactly as thick as the height of the bulb : say, a tulip two inches high as it stands on a flat place, let the soil be two inches higher than the top part of it ; the scilla is half an inch high on a flat place, let there be half an inch of soil above the top point of it. There can be no mistake about them if this be attended to. Let the soil be half light good loam, friable and clean, and half cow-dung rotted into mould. In this soil everything will grow in the first style and condition. When these have been a month in the dark,—a dark

frame, say, or where there is not convenience, covered with ashes,—they may be drawn from in such numbers as you are likely to want in flower at a time, and they may be taken into the forcing-house at once. When they have been in the dark six weeks, let them be removed from the dark frame or from the stuff they are covered up in, the pots cleaned and placed all in a cold frame, but a light one, and every fortnight there may be some of them put into the forcing-house to keep up a succession. The same rule must be observed as to cool night temperature as we mentioned for roses; but, as the rose-house is the best for them, or rather, as the treatment of roses is alike good for anything that ought not to be drawn up weakly, the same houses will do for all sorts of flowers, bulbs included. As by the time the first bulbs are out of bloom the open ground is too cold for turning out, let the pots be placed together on the floor of the greenhouse, under the stage, or anywhere secure from the frost, and not damp. Those which come after, and indeed all bulbs in May, should be turned out into the open ground; where they will frequently ripen their seed if wanted, and in some measure improve their bulbs. But, if the foliage turn yellow in the pots before they are turned out, let them dry off at once, and save them for another year, bagging them for the rest of the year till planting time.

GROWING PLANTS FOR HOME DECORATION AND FOR EXHIBITION.

The great difference between these two occupations will hardly be anticipated. There was always an opposite mode of treatment required in many particulars; but the system of showing has become so widely opposed to judicious management at home, that gardening for “the home” and “the foreign department,” as we may call it, affect us like two different sciences. The necessary preparation for transmission from one place to another, and constant jumbling about, has converted all our natural plants to artificial ones. Not one production in a hundred is shown in its natural form. We can excuse this, when we remember that plants have to be taken for miles, jumbling up hill and down dale, over rough roads and stone streets, before they get to their destination,

and then have to be got into these vans and brought home again, the same day or night, as the case may be ; for if the branches were in their natural state, playing freely in the air, they would be frayed to destruction by the mere action of rubbing against each other. But we must own, at the same time, that a plant with every branch and bloom constrained in its place, and bound mechanically to some formal support, is no more fit to compare with one fairly grown and unconstrained, than an artificial plant would be with a real one. It is to the ambition of growers to produce enormous plants that we trace the great change that has taken place in public exhibitions.

There is as much difference in a plant grown properly, and standing undisturbed in its place at home, and one grown artificially in an iron cage, as it were, and all the branches and blooms bent about so as to come to the outside surface, as there is between the sham flower and the real one ; and he who for one moment gives himself the trouble to think of the formal, stiff, and unnatural shape of the plants at a show, and the beautiful free growth of the specimens in a private collection, or a nursery where there is no showing, will not hesitate to pronounce those at a show altogether spoiled for the lovers of plants. Nevertheless, those at a show form masses of flowers, which in some measure compensate for multitudes of wooden legs and iron bird-cages. We have seen this for years getting worse. Hill, of Hammersmith, used to exhibit geraniums without sticks, and they were beautiful, far before anything we have in the present day as specimens of growth, though the prodigies of the present period rank far higher as specimens of mechanical ingenuity and skill. The system is altered ; Mr. Hill, if he were showing now, would stand no chance against wooden legs : he would not show half the number of flowers without drawing his plants, as they are always drawn now, and putting legs to them because the drawn plants cannot support themselves. We never approved of this perversion of garden craft, but we must take things as we find them. The best showers we have, acknowledge that props are objectionable, but necessary while size remains so captivating as it is at present ; and he is the best artist, we cannot say gardener, who can make his props the least conspicuous.

The cultivation of plants for show, then, involves an early

and intimate acquaintance with the use of supports, and in proportion as a man acquires this, he becomes careless as to whether his plants are drawn or not. He stops his plants back that they may make more shoots than usual, or than is graceful, because he wants all the branches he can to make a surface of flowers, and as soon as the plant assumes anything like a moderate size, twigs are placed to guide them outwards or upwards, and at equal distances; for all the harm it could do, he might almost roll the plants about the floor, without displacing a shoot or a leaf. As the plant advances beyond the distance already provided for by the sticks or twigs that support them, others must be placed there to answer for as much more growth as they well may, or as the specimen is likely to attain. This applies to all kinds of plants shown according to the present system of propping with wooden supports; roses in pots, fuchsias, geraniums, too many of the hard-wooded plants, verbenas, petunias, and many others. But there is yet a more idle and more obnoxious mode of growing plants for show. We have seen complete iron frameworks or cages, and inside these, the plants, such as *rondeletia*, *hovea*, *eristemon*, *chorozema*, and many other plants of great merit crowded, the stems distorted all manner of ways, totally destroying the nature of the plant, concealing its habit, and contriving to just bring the shoots through upon the surface. It is true that these cages are made of a cone form, or like a pyramid, and with gardeners of taste, as near the natural form of the shrub or plant as may be, and that some allow the shoots to protrude as far as they safely can, to break some of the stiffness which too many have not the ability to conceal; but constraint seems to be the prevailing appearance, and some of the most graceful of our favourite plants are thereby rendered artificial. The judges at shows ought, in our opinion, without any reference to the size of plants, always to decide favourably for those which are the least constrained, and therefore the most natural.

The growing of plants for exhibition, is, under these circumstances, almost a science of itself, and the chief evil to avoid is that of allowing the specimens to get ahead of the training, whatever that may be. Strong supports for the centre branch, and very little else will do, if they are all to remain at home; but for exhibition, the several branches must be supported independently, with upright props of wood, until

the specimens have attained, within a season or two, the requisite size ; then they ought to have their principal shift, and their cages—we can hardly help calling the wire framework so—must be put to the pot or tub, whichever it may be, and the branches trained to the outer wires instead of to uprights. By keeping this frame well within the rim of the pots, with regard to size, and allowing for a growth a few inches outside, the plants will soon conceal what to us is the obnoxious appearance of the frame, because in many kinds of plants even these shoots may be stopped back, and the laterals make all their growth outside. It is at this time, when we may at least either prune back irregularly, or leave the uneven growth to make its own way, that a good deal of the stiffness may be got rid of, and some approximation to nature be made. *Epacris*, *hovea*, *chorozema*, *rondeletia*, *eriostemon*, and many other plants which are naturally weak in their branches or straggling in their growth, being assisted up to a certain point, and then allowed to push naturally, may be produced much better than we have seen them, even in the constrained growth for exhibition, and to unobservant spectators may appear like a fine natural cultivation.

The more robust heaths, *Eriostemon buxifolium*, *ixoras*, and some other hard-wooded plants, can be grown without much support, if not grown too fast, but if we excite them too much, they also will be weakly and want some kind of stay in profusion, instead of here and there an occasional prop.

The fuchsia, which is a favourite exhibition plant, may be grown very rapidly, but always at the expense of quality, first perhaps, because prizes are offered for them in May and June, whereas the earliest they ought to be shown, for their own sake, is July and August, or September is better than even that. We are all anxious generally to show new plants at the earliest period, and as a plant may be grown ten feet high from a cutting in a single season, we constantly see the varieties let out in autumn shown the next spring, much to the disparagement of the variety and the exhibitor, except that he gets the promised prize. The fuchsia, for style and appearance, as well as the full development of the capabilities of a variety, should be grown in a pyramidal form, and full of branches. To do this effectually, the plant should not be hurried. It should be strong in the main shoot, and not

want a protection, or rather, not be weak enough to require a prop. It should, at the end of the season, be allowed to rest ; as soon as it indicates new growth, it should be repotted, not in too rich a compost, and be pruned with short branches at the bottom, shorter as we go upwards, till they are mere spurs when we get half way up, and tolerably close at the top. By growing the plant gently in the greenhouse and without any heat, the branches of the season will be multiplied greatly, and with a very little checking, form a very beautiful close pyramid, full of foliage and bloom, and the colours in perfection. Besides this, the plant will bear carriage without propping, and whatever support it wants for travelling, if any, may be all taken away at its destination. The fuchsia, however, will bear growing as a bush or as a pyramidal plant. In the former we have to stop a cutting before it is two inches high, and to continue stopping all growth that is too vigorous, and all early growth, directly two eyes can be left, so that by inducing lateral shoots, we secure a bush in miniature at an early stage, and need only shorten such branches as are getting on too fast for the remainder. All very weakly shoots should be cut away close home, for they only weaken the rest and confuse the order ; branches should not cross each other, nor should the plant get confused by reason of the number of branches allowed to remain. The habit of the variety under cultivation should be studied a little, but there are too many grown that deserve only throwing away, and a bad habit is rarely compensated for by a good flower, because the fuchsia depends for its value a good deal on the habit. *Formosa elegans* and *Riccartoni* are of fine habit ; few can equal them in this respect, while both may claim some credit for their early approach to the requisites for a good flower. Set both of them in pots, in moderate soil (not rich), and after this, give them only water when they want it, and all the air you can. They will scarcely require a shoot to be lopped ; so fine is their general pyramidal habit, that unless accident blighted their leader, they would be compact, and at their season full of bloom. At the end of the year, when they had done their work, as it were, they would lose their leaves, and would only require to be kept from the frost : they would want larger pots at the beginning of the year, all their side branches shortened, and, if the leaders chance to be injured, they should be shortened to a strong

shoot, and that trained upwards by a temporary support ; but it is far better to save the original leaders. The next year's growth would be better than the first. It would be necessary to thin out many of the shoots, because they would be too thick otherwise, and confused, but there would be as much difference between these plants and those usually shown as between two several families. They would be one mass of bloom from top to bottom, and models of what fuchsias should be ; but they must be grown without heat the second year as well as the first, and as a general rule, without any exception, fuchsias should have no artificial heat ; they would grow as well out of doors as in doors, if not better than under any covering, but they would not come in for May and June shows, and therefore, the giving of prizes at these shows for fuchsias is bad in principle.

STOVE PLANTS.—Stove plants generally are of easy culture, and many of them would be better without any other attention than providing them with heat, moisture, and light. There is very little merit in bringing things out of season, unless some object is to be gained, yet we constantly see injudicious prizes awarded for flowers out of season, much to the detriment of the plants in general appearance. One precaution should always be taken with forced flowers and stove plants wherever they are to be exhibited, and that is to remove them, a day or two before they are shown, from the forcing-house or stove to the greenhouse, to season them gradually to the cooler element, before they encounter the draughts in a tent or the changes of removal. It is no uncommon circumstance to see stove plants actually drooping from the sudden changes to which they have been subjected, when a day or two in a cooler house would have prevented it. Avoid, as much as possible, on all occasions, a confused growth ; it is as bad as a scanty one.

There is not a handsomer stove plant scarcely the year round than the *Euphorbia splendens*, well grown, but the majority of those we have seen have been a confused and ugly mass of branches crossing each other in every possible direction, presenting flowers half their proper size, and branches scarcely able to support themselves ; and yet, under proper culture, nothing can be more robust. Nothing more is required in the culture of this plant than to thin out and regulate the number of branches, shortening them when growing, but when they

push out laterals, to take off all that will not add to the beauty of the plant, which should form an open but pyramidal object, blooming constantly at the ends of the shoots, and constituting a very beautiful object ; but, like all other plants, when neglected, rambling about with twice the number or more of the shoots it ought to have, and these in the worst places for effect.

We could instance many plants that are never grown in perfection, and that are rarely fit to be seen at home or abroad. Many of these may be classed among neglected plants, for they may be found in many establishments allowed to ramble their own way, perhaps yielding a cut flower now and then, and never thought of as an object of ornament.

GREENHOUSE PLANTS.—To grow plants for home gratification alone, we need not be at half the trouble, and certainly produce twice the effect. We may allow them to grow without extraordinary support. They have at most to be removed on a hand-barrow from the stove or greenhouse to the conservatory, and the natural play of the branches for that short distance damages nothing. The shortening of branches, the training and general management, have reference only to their intended situations, and the principal thing to guard against is not to excite anything too much. Very few things bear growing fast ; it always makes a greater distance between the leaves, and consequently the plant looks poorer : and this poverty is of the greatest consequence, because more conspicuous when the plants come into flower, for blooms depend on the number of branches in a given space, and if the branches and leaves are more distant, the blooms must be so likewise. This is shown very conspicuously in plants which bloom at the base of all the leaves, as in fuchsias, epacris, and others of the same habit. Besides, compactness is a great point in all plants ; not when carried to confusion, which should always be avoided, but when induced by moderate growth and judicious pruning, or stopping.

The *Hovea* is one of the most ill-used plants in cultivation ; it naturally grows fast in excitable compost, but it can scarcely be grown with too little dung, or soil too simple, so it be healthy and clean. The earliest stopping, even when first struck as a cutting, is necessary : not more than the pair of leaves next the soil should be left, and this throwing out two lateral shoots gives us an opportunity of stopping both at the

first joint, and thus obtaining from each two more lateral shoots, to be stopped in turn for the same number again, and so continuing until there is a perfect bush ; but the plant cannot be neglected many days. This constant stopping until we have branches enough will produce an excellent plant ; it is then by taking off all that are in the way, and leaving only such as will help to make a handsome plant, we may allow the growth to go on till they bloom ; but after bloom the plant requires pruning as regularly as a wall-fruit tree, and the new shoots must be watched and regulated, and the same provision made for the beauty and symmetry of the shrub as was made in the first instance. Were the flower left to itself and planted in rich soil, it could be made to grow six or eight feet in a single season, and be altogether unmanageable in a season or two, because the bloom only comes at the ends of branches, and the long under portions are always leafless as well as flowerless.

Heaths require great care, as well as some study of their habit. Some, like epacris, run away to great length of branches ; therefore, before we allow them to shoot their full length, we must, by stopping, secure plenty of them. Others are naturally of a bushy habit, and require thinning out rather than stopping ; but in all plants we have to look well to the growing state when they are manageable, for a very brief neglect, only for a single season, will give us bare stems, naked undergrowth, ill shapes, and often unhealthy constitutions, and the best thing we can do then is to strike the tops of the plant for young stock, and to cut down the stems to within a few inches of the pot, for the mere chance of their breaking and making fresh growth.

There is, however, one method by which we may occasionally convert an ugly gawky plant with naked long stems into a handsome standard, but it is only a few plants that will look well under such a change. The *Azalea indica* is one of these. If there be one straight stem among them, cut all the others close down, and cut the branches of the single stem off up to the part where the head is to begin ; cut it down a little at top to make side growth, and the head will soon form well, but until the head is large enough for the height of the stem, it will look very poor. Fuchsias of some kinds, particularly *corymbiflora* and its varieties, naturally carry large bunches of blossoms, tassel-like, at the ends of the branches. The

best thing we can do is to take off all side growth to the height we wish the head to begin, to stop all the other branches to two joints until we get a sufficient number of branches to hang gracefully all round, and then to let them grow to bloom. The pendulous habit of the plant is greatly favourable to this, and the blooms fairly weigh down the most obstinate of the shoots, so that the plant really forms a pretty object. These things we can do for plants to be kept at home, but there would be the greatest difficulty in transplanting such plants to a distant show. The exhibitions are therefore very detrimental to the garden at home, and besides this, they give a very poor representation of an establishment which may possess much more beautiful plants than the owners choose to send out. In winter, the temperature of the greenhouse, 40 degrees by night, and not more if you can help it, and 50 degrees by day; in summer the cooler the better.

SHOW FLOWERS.—Even the plants from which we are to cut blooms to show, are but sorry objects in a garden, and unless there be a plot laid out on purpose for the flowers to cut, the gardens cannot be kept clean and tidy: shades here, glasses there, props to keep flowers in a particular position in one place, and all sorts of ugly contrivances in another; plants cut up to a skeleton to give vigour to particular blooms, and stripped of all but the few promising flowers. A truly enthusiastic exhibitor is never fit to be seen at home except by his equals, who of course take a similar interest in all the paraphernalia attendant on growing for show. The pink stripped of all but forward blooms, with a glass over one, a shade over another; cabbage leaves upon glasses during the heat of the sun, paper caps over others, render it an eye-sore instead of a beauty; dahlias with tables on the side, for the convenience of tying up a flower to be covered by a pot, the branches cut away, not more than a solitary bloom here and there allowed to be seen;—all tend to set the lovers of a garden who have not been bitten with the exhibiting mania against competition, because the beauty at home is destroyed for the fame abroad.

But show flowers are the flowers to grow at home, and those who delight in them can put up with a rose or a dahlia half an inch smaller for the sake of the abundance, and are unwilling to sacrifice half their pinks and carnations for the

sake of a little size. We recommend for home use that all the means be taken except thinning the flowers and shading them, and that all the best varieties be grown; but when a man can afford to lay out a piece of ground from which to show, and to leave his other portions in perfection as a flower garden, he should do so. We do not know that we should tie up a pink or a carnation to keep the pod from splitting if we were not going to show, though we might limit a pink, a carnation, and picotee to three blooms each, because it gives them room to grow in perfection. But picotees, carnations, and tulips, may be grown for show without destroying the general appearance, because they are grown under an awning in a pleasant summer retreat, as it were, and certainly have a noble appearance in collections.

It is with flowers and plants as it is with farm stock. None but those who take an interest in exhibiting would care to go into the oil-cake and stall-feeding apartments to see over-gorged beasts; they would delight in seeing the sheep and cattle in the fields. So in flowers, none would care to go among the florist's littering apparatus and nursed isolated blooms, but those who could appreciate every mark that made a bloom better or worse; the rest would rather go into the highly kept parterre where roses, dahlias, pinks, ranunculuses, and other beauties were rivalling each other in the natural ground, with no covering but the heavens.

The chief difference in the culture for our own enjoyment in the garden and the management necessary for exhibitions, is in exciting the show flowers and plants to what we call perfection, by restraint for the convenience of carrying, to size by limiting the numbers, to colour by unnatural means, to compactness by vicious training; while the natural beauty and habit looks more effective for domestic gratification, and answers every purpose for local enjoyment. It must not, however, be forgotten with regard to out-of-door culture, that the sun shortens the season of bloom: the rain often destroys the beauty. It is only such things as can be grown wholesale under cover that we fairly enjoy in both capacities. The superb bed of tulips under its canvas roof would be an ornament to the finest establishment in the land; and the house is not less interestingly occupied when the bulbs are in their boxes, and the carnations and picotees occupy their places under the canvas roof, because the same shade and covering

that preserves the flower from sun and rain is equally agreeable to ourselves when inspecting their gorgeous colours and exquisite forms.

PRUNING AND TRAINING IN GENERAL.

WALLFRUIT-TREES AND ESPALIERS.—Many gardeners have said that great evils arise from being afraid of using the knife; but it is possible to be too foud of it, and certain it is, that by too free a use of it much time is lost; and the study of this branch is almost the principal, and at any rate one of the principal, objects of a good practitioner. The knife is, perhaps, most freely used in cutting back fruit-trees. When grafted or budded, and grown one year, we have generally a long straight shoot. See two men, equally clever in their vocation, treating one of these maiden trees—for such they are called at one year old: one cuts it down to three eyes, the other bends it down to as near a horizontal position as he can, and does not cut at all; he lets all the buds that he wants grow, and rubs the others off before they fairly start, consequently he has half a tree almost immediately; but as he wants the other half, he allows the bud nearest the bend or trunk of the tree, as it were, to grow up, and rubs the others off all along for some distance, to give the leading one more vigour; at the end of the second year he has a tall well-grown rod to bend down horizontally on the other side. He holds this doctrine:—it is reasonable to suppose that the less wood you lose, the more vigour there must be in the branches you save, and that disbudding is a much more natural way of preventing useless branches than letting them grow first and cutting them off afterwards.

The two trees, under different treatment, exhibit this peculiarity. The one which was cut back has three branches, moderately strong; but, for regular training, it requires to be cut back once more all the branches to three eyes, which will produce nine branches for the next year, of nearly equal strength, but not so strong as before, on account of the greater number. In the one merely bent down, and all the useless buds rubbed off before they took anything from the tree, the vigour of the tree is only expended on the portion required to be grown; and this treatment will have many advocates, because, among other objects, with the amateur gardener

especially, early fruiting is one, and the cutting back twice must delay three years at any rate, while we have known the first laid branch actually bear fruit the second. Perhaps a mixture of the two practices is the best. We should bear in mind, that whenever a useless shoot is allowed to grow, it helps to weaken all the useful ones, and therefore that by dis-budding we save the tree from making wood merely to be pruned off. Again, we might profitably bear in mind that every cut is a wound that may bring disease, and that the more snags there are about a tree, the more subject it is to damage; and it may always be found that peaches and nectarines grow finer in those portions of the tree least maimed by the knife. We have, when grafted or budded trees have been in the places they were to remain in, very successfully conducted them through the first year's growth by judiciously stopping a main shoot at an early stage, and disbudding every useless beginning—leaving, in fact, no shoots but those we really wanted, and thereby throwing the whole of the growth into proper branches. There is a vast difference between not using the knife as a rule, and not using it because you take care that it is not wanted. Suppose a peach or a nectarine budded, and in the place it is to remain in against the wall: by the time the bud had shot to three or four pair of leaves, the top is pinched out; laterals immediately break out on both sides, and you have a little tree the first year, every branch of which may be nailed into its place, beginning with the two lower ones quite horizontal, the next and next rather fan-fashion, but still keeping them well down, and the knife not used at all, unless to cut out here and there a stray wiry shoot that is not wanted, but has been overlooked. The next year, as soon as the buds move, go over the tree, and cut off every one that will be useless, if grown. This disbudding system wonderfully helps the growth of the useful branches, and helps to nurture the tree; for it stands to reason that if an enormous quantity of growth has to be cut away afterwards, it was wrong to let useful portions of the tree suffer to make wood only to be cut away; besides which, all stone fruit-trees are more or less healthy according as they have been more or less carefully managed; those which have been wounded most being the most liable to gum and canker: and, moreover, the operation is so easily performed. So, also, if we want lateral shoots to fill any particular place on a wall,

or, in other words, want three or four shoots where only one is coming, instead of waiting till the autumn, to cut back such a branch, pinch the top out as soon as it has advanced as many leaves as you want shoots; for you may stop it at the first pair of leaves, or after it has made three or four, according to what you require.

It is a safe conclusion, that pruning retards fruit-bearing. The argument on behalf of the knife is, that it prepares the tree to fill up its given space in a proper manner, and permanently benefits it; but the knife will do nothing that cannot be done with disbudding and pinching out, only that the latter mode requires constant watching, until the growth for the season is adjusted or fairly set in, and even then an occasional examination is required, to see that no fresh growth has started where it is not wanted. Every time a tree is pruned, a more vigorous growth of the remaining parts is a natural consequence, and vigorous growth is always against bearing. We adopt the disbudding system, and rarely shorten the branches, for at the ends are the most fruit-bearing shoots; and, instead of allowing hundreds of little branches to form so much brushwood all over the tree, we rub off the buds before they make any progress, and only leave them to grow where we want shoots. These remarks apply chiefly to wall and espalier trees; but the same general principles apply to standards, so far as we can carry them out. It would be a work of time to go over a standard tree to disbud it, but it would be all the better for the process, and save after pruning.

There has been a good deal written upon the subject of pruning, and if an unpractised man reads it all, he will leave off perfectly satisfied that authors contradict each other; that they hardly agree upon general principles, and that he is none the wiser for all he has read. One is all for the knife, another for no knife where it can any how be done without; one for horizontal training, another for the fan-shape; and in Abercrombie's "Every Man his own Gardener" may be seen more than a score shapes into which a tree may be tortured, all very seriously recommended by somebody. It seems to us that we can never err much in following nature's general rules, and beginning with the lowest branches horizontal, proceed with the other branches a little sloping upwards, and completing with the fan; but we do not hold with any set figure; the great object is to fill the walls well, because as

trees on a wall have not half the branches, these branches will reach a much longer way, and the filling of all the spaces is a far more important consideration than the exact figure which is proposed to be accomplished by training. Some authors are partial to the serpentine, or undulating form, in which to train the branches of wall-trees, and it is founded on this fact,—if a branch be bent downwards, and so fixed, the strongest shoots will come out nearest its base where it joins the tree, in other words at the highest part of it; whereas if it be placed sloping upwards, as it would naturally grow, the strongest shoots would come at the end furthest from the trunk. It is therefore concluded, that by distorting the branches, and thus interrupting the free passage of the sap, the development of branches and fruit may be more equalized. Hence, we see one author recommending the branches of a vine to be bent like a snake in motion, another advocating the branches of wallfruit-trees, especially the peach and nectarine, to be bent serpentine-fashion; but when we have constantly before us examples of plain simple management producing first-rate fruit, and plenty of it, all this fanciful stuff seems mere child's play. The truth is, that gardeners too often begin by putting fruit-trees into extraordinary rich borders, exciting an unnaturally vigorous growth, and then have to employ their wits to counteract mischief of their own creation. Fruit-trees want nothing more than good natural loam; all the made-up borders will, perhaps, when the gardener has brought his trees into proper subjection, give larger fruit, with invariably a weaker flavour; for it is one of those laws which cannot be abrogated, that the more vigorous the growth the milder the flavour, and, so that it be healthy growth, the slower it is the stronger the flavour; so that, however desirable splendid-looking fruit may be, size is always attained at the expense of flavour, as if a certain quantity were assigned to each fruit, and the increased size weakened it. It is this which makes size so desirable in vegetables, which are the milder for it, but beyond a reasonable specimen, not desirable in fruit, because we desire richness instead of mildness, when the flavour is desirable at all. The more aromatic and rich the juice of a pear, the better; but the milder the cabbage, or the turnip, or the onion, the more it is esteemed. But unfortunately, the taste, we mean the intellectual taste, is a good deal perverted in the growth and

appreciation of fruit: so that the grape be a good colour, the larger the bunch or the berry, the better the judges seem to like it; a position, however, that we invariably oppose, and will, wherever we have a voice, settle by flavour. We have often said there is no merit in exciting an unnatural growth; nothing is much more easy than to grow for size only, but it is one of those propensities which we do not approve, where it can only be had at the expense of a better quality. We are convinced that in the long run natural growth, in natural soil, if it be at all congenial, will always best suit the amateur; and natural training, with no more knifework than is absolutely necessary, will be found the most easy to understand, and least difficult to manage. We have in another place given our notions upon fruit-borders; and if we could command all the exciting soils and manures in the kingdom, we should use none of them in an ordinary border for fruit-trees.

The proper training and management—for, as we have before explained, the less pruning the better—may be reduced to general principles, which may be, we think, easily understood. Our first object is to cover the wall with bearing, healthy wood; therefore, whether we begin with a tree that has been on the wall and neglected, or a new one, it is safe practice to train down the lowest branches horizontally, or, if they start at some distance from the ground, bring the ends as near the bottom of the wall as a few inches, and bring down the next as near to them as will only allow of the bearing-shoots to grow between, and so on with other useful and available branches, for as there is no fear of the upper part being filled by ulterior growth, we have to furnish the wall as low as we can, because branches will not grow downwards to fill that out, though there will be no difficulty in furnishing all above. Our next business is to watch the budding, and wherever the wall has room for a shoot, let the best bud for the purpose be allowed to grow, but rub all others off. It is of no use letting shoots grow for the purpose of cutting them off hereafter. If in any part of the wall there is room for two or three shoots, and there is only one bud, take the top out of the shoot it makes, as soon as there are two pair of leaves, and from the four shoots thus produced use what you require, but stop the one you do not require as soon as you can after it starts; but if you want only two or three shoots out of four or five, it may be worth while to give time

to see which will grow best, and stop the other or others. We do not like shortening branches at all ; the bearing-wood on standards is always at the ends of the branches, and in wall-trees there is much the same tendency, although from the very trunk itself being exposed to the light, bearing-wood may be encouraged pretty nearly all over the surface.

By attending to these few general principles, which are exceedingly simple, the amateur may secure a pretty good supply of peaches, nectarines, and apricots,—that is to say, by allowing the buds to grow where you require wood to fill the wall, and by rubbing them all off where the wall is already full. Pruning is then only required to repair oversight, and occasionally to cut out old wood where young bearing-wood can be made to fill its place ; in short, the actual cutting away is the exception instead of the rule. In very rich borders, where the growth of the trees is unnaturally strong, the gardener is obliged to let all the young wood grow, and then at the winter pruning make choice of the best wood, and slaughter the rest ; but we prefer from the beginning growing them in ordinary loam, which induces a sound healthy growth, of sufficient strength to produce a good crop of fruit, which may be thinned to the number that the tree should bear. If we have a maiden-tree newly planted, we may cut it back to three eyes, and while the three branches are growing, it is likely that the two lower ones will be unequal ; in this case fasten the one which is growing strongest horizontally as it goes on, and let the other be fastened nearly upright, because it will grow much stronger, and before the season is out overtake the other, for the horizontal position certainly checks the growth, while the vertical, or anything approaching the perpendicular, encourages it. At the end of the summer, when they have done growing, both may be trained horizontally, or, if they start far from the ground, they may be bent down lower at the ends than they commence growing from. The centre branch may then be bent down to make a second shoot or branch on one side, and have all the buds but the end one and the one nearest the base rubbed off ; this bud nearest the base will grow as strong as the one laid horizontal, and be fit to form its match on the other side. This branch may be served the same as the other, all the buds be rubbed off but the end one, and the one nearest its base, so that alternately the branches will

be made to fill the deficient space until the wall is full of main branches, and you have only to regulate the bearing-wood, by rubbing off the buds where the shoots are not wanted, and leaving them to grow where they are required. But there is certainly an alternative that many prefer to the laying down of one branch a-year, and that is when the first year the two lower branches are laid in as low as we can, to cut down the centre to three eyes, by which two more branches can be made instead of one, by sacrificing the centre branch instead of using it for one side. It is true that we only get a pair of horizontal branches a-year by this plan, but it is also true that the tree is matured as we go on, and there is nothing to prevent us from enjoying the fruit in perfection, though there may be less of it. Pruning is always necessary at planting, but, as we have explained in the article planting, this is to compensate for the loss of roots in the taking up of the trees; as, however, in the bustle of a nursery business the growth of young trees is not always attended to as it should be, pruning may be required to get the tree into a proper form of growth at its first starting. This may apply more to standards than to wallfruit-trees, because at most nurseries the breaking buds are watched; and although at some they care for nothing but the single rod or shoot that the bud naturally throws, there is some ground that will form a moderate head the very first year, by the bud being stopped when there are two pair of leaves, and the best three of the four branches being allowed to grow.

These general remarks will suffice to give a pretty good idea of the pruning and training of the better kind of wallfruit-trees, and one point may be very generally kept in view with advantage: wallfruit-trees growing wild, that is, unchecked, and therefore too full of wood, may bear more fruit in respect to numbers, but it will be of inferior quality; but of the two evils, a tree had better have too little than too much pruning, for we have known (and that where one might expect better things) many trees pruned and trained year after year, the branches shortened, and the trees kept neat by jobbing gardeners, and the bearing of fruit was the exception instead of the rule, and at the best but few were ever seen at all. Our advice was once asked for in a case of the sort, and we recommended the owner to let them go a year without using the knife at all, but to lay in and fasten all the young wood

as well as he could himself, or stand over his jobbing gardener while he did it, and to pay no attention to any remonstrance on the part of the gardener. The consequence was an abundant crop, requiring three-fourths to be thinned out; of course this was going from one extreme to the other, but it was a lesson even to an ignorant man, that he had to steer a middle course, and not to cut away all the bearing wood. The difference between the peach and nectarine, and pears and cherries, is that the former bears upon the last year's wood, and the latter upon spurs of two years standing. In those trees which should be trained horizontally at bottom, and indeed may be so trained from bottom to top, the centre, or main stem, must be only shortened at such places as will enable us to keep the branches at proper distances from those beneath. Pear-trees, for instance, require eight or nine inches between them, to give room for the fruit; therefore the first two branches being laid down, the centre must be shortened so as to give two branches to lay in at a proper distance above them, and when we have seen which two are the best for that purpose, we disbud all but the top leader, which must go on for the next pair of branches; so that we in fact get one pair of branches each year, and no more. The position of branches has a good deal of influence over their growth. When they are once brought down to the horizontal, they grow very slowly; this induces some to keep them growing in a sloping direction till they are as long as they are wanted, or nearly so; but it should be recollected, that a branch one year old is much more tractable than one of two years old, so that we recommend them to be laid down at one year old, or that, at least, they be constrained sufficiently to enable us to complete their proper position the second year, at most. The three branches that are growing for the next pair of branches, and the leader, may grow upright, if they will, because they unquestionably progress most according to their elevation. It was on this ground that we recommended the shorter one always to be kept more upright than the longer one, that they might at least be more uniform; but we should be content with the progress of the horizontal branches after the first year, or, at the most, after the second, whether they extended as far at first as we desired, or not; for it is impossible to ensure any uniformity if the branches are allowed to mature themselves into stubborn wood. By continuing

this system, the branches will, in time, occupy the whole height of the wall, and by avoiding that stimulating soil which is too frequently prepared for fruit-borders, the trees will be found much more manageable, and much sooner prolific.

It is a very common practice, and we have seen it a good deal in market gardens, to let the trees grow pretty nearly as they will, to lay in the branches as close to each other as they will do well, but as they all start from one common centre, as it were, they necessarily form into a fan shape. There is nothing to condemn in this, because every day's practice shows good crops. The only rule that seems to be observed is, to lay in every winter as much bearing wood as can be accommodated, and to cut away weakly shoots, and all others that are not wanted, or, in other words, that there is no room for. Certainly, if any class of men have to find out the least troublesome and the most profitable mode of culture, it is the market gardener, and, therefore, however careless they may seem, there is the strongest motive for doing everything with the least trouble, and making everything produce the best crop. However, in private gardens, where this is not so much studied as neatness and moderate returns, we may be allowed to be more particular, though there has always been a good deal too much importance attached to certain details, and the works which have treated of pruning and training have, one and all, so far as we have read, laid down rules as if no other would answer, and made simple operations appear so formidable, that many a man has been deterred from undertaking what, after all that can be said and done, is but a simple affair. The general rules for pruning and training will take us through nearly all the wallfruit-trees and espaliers, for the only difference between the one and the other is, that the espalier is in a frame instead of a wall; but there are some little differences in the detail with fig-trees and grape-vines; the former we shall notice here. The vine out of doors, and under glass, will be a separate article.

FIGS.—The fig produces its fruit at the ends of branches, and has generally two crops a-year; though, in this country, the tree requires a wall, and unless protected through the winter, the crop, which is always on when the leaves fall, will perish. There are two or three very simple rules for pruning and training the fig. There must be no shortening of

branches ; what is taken away, must be taken away altogether. There should not be too many branches ; where they come too near, sacrifice the worst, and leave the most vigorous. The fruit which is preserved through the winter will ripen early in the summer ; that which comes with the spring shoots will ripen, while the midsummer shoots will produce a young crop, which will be on the tree when the leaf falls. The fig, and especially some of the large-growing kinds, is a rambling grower, and there is no help for it ; we have only to do the best we can with a tree which only likes the knife at the base of a shoot,—that is, it does not flourish with shortened branches ; and many who have complained that they get no perfect fruit, may frequently attribute it to pruning. Sometimes, however, it is from being too much excited ; the fig is a succulent plant, and where it is in rich soil, it is beyond control. When a branch is shortened, it will be found sometimes to die back, or cause every bud to grow ; the best plan is to let it, to a certain extent, have its way ; but where it gets too thick, to cut away some of the weaker branches close to the wood from which it springs, and on no account to cut back a branch, for it is on the ends that our greatest hopes of fruit depend. If you are going to commence fig culture, obtain the most dwarf kinds ; first, because they are the easiest managed ; and next, because, for the space they occupy, they are the most prolific. That the fig does best without too much excitement, is proved by the success attending its culture in pots ; for we have had them not two feet high, with a dozen ripe fruit on them, and in twelve-inch pots. To return, however, to the pruning. There is no tree that is more apt to throw up suckers, and if these are not removed very close to the root, the cutting of one down will cause half a dozen to appear, and there will, if the plant be neglected, be a complete thicket round the stem of the tree. Laying on the lower branches as near horizontal as possible, will generally cause every bud along the whole branch to grow ; and the best way to manage these, is to rub off all that are not wanted—perhaps, every alternate bud can be well spared, for the benefit of the remainder. We have seen some of the dwarf kinds grown like bushes, and others like dwarf standards, in a sheltered place, bearing well in their season ; and, if we mistake not, they may be seen now in many old places ; but the same treatment must be observed. One thing should be

kept in mind in pruning the fig ; it bears large foliage, and consequently the branches require a larger space than those of most other trained fruit-trees. But this space cannot be provided by the mere cutting away of supernumerary branches ; such treatment would have a directly contrary tendency, and if the trees manifest any disposition to produce too many branches for the space, there is no alternative but checking them by pruning the roots.

STANDARD TREES.—This part of the gardener's duty is too often neglected. The orchard is mowed at a proper time, because it is the business of the farm ; but as to the trees, in too many instances, the gardener only looks at them when in bloom to see what prospect there is of a crop ; and, occasionally, as the crops advance, to see how far his hopes are likely to be realized ; this is all the attention that many orchards get, except the gathering of the fruit. As in the case of wall-fruit-trees, the soil the trees are in settles the question about the quantity and the nature of the attention required. A newly-planted orchard requires pruning to compensate for the loss of roots ; and if this is judiciously done, the heads of the trees form as they ought, and an examination in the autumn will show us how far the knife may be authorized to remove useless, weakly, and unprofitable shoots that tend to damage better ones, fill up the head, and exclude the light and air. But if this can be done profitably with a young orchard, how necessary does it become in an old one, which may have been neglected for years, until scarcely a tree can do justice to the fruit it produces. In many of these old orchards the trees have so degenerated that the sorts of fruit can scarcely be recognised. The pruning in this case is a laborious task, for nothing will do but reducing the heads considerably. The first object is to remove all the branches that are most decayed or cankered ; next, all those which are most straggling, and in the way of those who have to walk about the ground ; then we may look to those which cross one another, or crowd one another, and of these remove the worst, or the one that can be best spared, so as to leave the remainder of the tree in the best form and order. If, after this, we can head down some of the tallest, we may hope for better growth and crops. If the heads are choked up, as we often find them, with little brush-wood, that is to say, their weakly shoots, clear them all away, so that you leave the heads free and open. But standard

trees in general only require the removal of weakly shoots, the occasional checking of over luxuriant branches, and of such as are growing into an inconvenient or ugly form ; yet this should be done once a-year, and the trees might be kept as much in order, though in a different way, as the neatest trained wallfruit-trees. Of the many whims and fancies that writers have promulgated for the form of standard trees, we shall say but little. They may be profitably trained hollow, the branches all round forming almost a basket, with no shoots inside to intercept the air or sun ; or they may be trained with a centre shoot, and branches all round it, pointing outwards ; or they may be grown almost like an umbrella, that is, with the branches pendulous all round ; but in the two latter forms, the branches must be sufficiently distant to admit plenty of light and air on all sides, and the style must be dependent on the habit of the plant. One way is only better than another, according to the habit of the plant it is applied to ; some naturally throw up their branches, and, therefore, are best adapted to merely have their centre thinned a little, and form themselves ; others grow naturally pyramidal, and only want their branches thinned ; others, again, are naturally of a weeping habit, and regard must be had to these characteristics before we decide how we shall prune and train. It is, perhaps, an old, but certainly a bad fault, to let trees run up to heights which defy the gathering of the fruit without more trouble than it is worth ; for no ladders can rest against the branches so as to place the gatherer within reach of the best fruit, which is always at the top,—so it would be if the tree were half the height. It is the fact of its being at the top, and not of its being so high up that makes it finest ; and it would be a wise and a profitable step to cut all the high trees down to half their present elevation ; for it is doubtful if the crop would be lessened after the first year, because, at present, the lower half is almost barren, and then it would be fruitful, and within reach for gathering, which is more than a good deal of the fruit is now.

DWARFS.—Dwarfs are to be treated as standards ; for it is merely having the head on the ground instead of at the top of a trunk.

STANDARD ROSE-TREES, CLIMBERS, AND BUSHES.—This is a very different operation to the pruning of fruit-trees, because, unlike fruit-trees, the roses bear their flowers on the present

year's wood ; every bud that grows forms a branch, and upon that branch grows the rose. The first object, therefore, of the rose-grower is to attain for his tree, or climber, or bush, the form and size he requires, and when this is done, he merely has to prune back all the summer's growth to a single eye, or to two at the most ; indeed, it is always found that the fewer the branches, the stronger they grow, and the larger the blooms ; but until the head of a standard is the size and form required, the cutting must be close where it has extended enough, and otherwise where it is not grown sufficiently. The head of a rose standard should be as large across as the stem is high ; a dwarf standard, therefore, ought not to be so large as a tall one ; and the height of the stem is the best guide. If the stock, or stem, be three feet high from the ground to the under side of the head, the head ought to be three feet across ; and the same rule should be observed for any other greater or lesser height. In selecting the branches which are to form a head, care should be taken they point outwards all round ; and as we begin with a plant, perhaps, with only one or two stems, our first business is to cut it down within two or three eyes ; as soon as the new shoots which come out have got four leaves each, pinch out their tops, and you will find the rose grow rapidly, with a thick small head. Now is the time to remove all but those which point the right way, and to let none cross each other ; let only such be left as will grow directly outwards, and from time to time take away all but these ; you may thus achieve the greater part of your object the first season. It may be that one side of the head is worse than the other ; be not afraid of spoiling its appearance, but cut it in well to the eyes that you wish to grow, and bear in mind that the single eye grows very considerably in a year. In selecting the branches that are to remain a tolerable length, for the purpose of forming the permanent head, we have to be careful not to select weak ones ; for, although they may hold their form pretty well at pruning time, they may be totally inadequate to bear the weight of the year's growth ; none but the strongest should be kept, all weakly ones should be cut off close home. There are many kinds of roses used as standards merely because they grow and bloom best on briars, but which are totally unfit to form handsome heads. Their growth is perfectly upright, or about as much sloped as the twigs in a birch broom ; these are only

fit for grouping and forming the inner plants of a close border ; no pruning nor management that we can suggest will make them fit specimens to stand alone. Yet they are superb roses, and fit to plant among a clump of shrubs, so as not to show the stock, or upon such dwarf stems, as shall not even indicate that they are worked at all. We are not so nice about what appears planted in the ground, as we are when roses are to form ornamental standards ; and be it remembered, that those who give orders for roses should always inform the nurseryman exactly what they want their roses for. If they require standards to grow in permanent situations, and to form graceful heads, they should not fail to say so. If they require very large or remarkably fine specimens for exhibition in bunches, or in single specimens, it is quite requisite the dealer should be made acquainted with the fact ; and, moreover, if they want roses to group in such a manner that they only show their growing parts, the upright growing ones are the very best, for they bear all their bloom on the top, and are, in fact, only adapted to stand in groups where their stems are hidden, or to be close to the ground, that their blooms may be under the eye. There is a good deal of tact required in pruning, but some kinds are of such graceful habit that they look better under even bad management than some others would with all we can do for them ; for, unless the branches are inclined to grow outwards instead of upwards, all we can do will not help them much. If you already have well-established plants of the kind which grows upright, and where, therefore, you cannot form a good head, choose whether you will remove them to form a hill, or clump of roses, somewhere else, or plant half-a-dozen round each, to make smaller groups on the spot occupied by the standard ; but you will assuredly never make good-looking, or even tolerable heads of them. We have seen the branches weighed down into their places, but when the new growth comes, that goes bolt upright again, and the side is as straight, and as bare of flowers, and as ugly, as when the branches all spring from the centre, only larger. We have seen many fine collections spoiled by this sad fault—perhaps a hundred or two standard roses about the place in appropriate and prominent situations, and one half of them of that ugly growth which only exhibit the side to us, and, contrasted with others which form a graceful head, they spoil the whole concern. Lose no time in trying to change the nature of these

heads, for it is useless. The year's growth upon the top of which the roses come is eighteen inches or two feet long, therefore, all that pruning can do stands for nothing; plant half-a-dozen handsome standards round them, of graceful habit, so that the tops of the ugly one, with all the roses, may just rise above the handsome ones. If we begin with a dormant bud, that is, a rose budded last season, but to start the present one, we should, as soon as it had grown to the third leaf, take off the top beyond it. With a kindly-growing sort, a branch will start from each leaf, and grow outwards, two on one side the original shoot, and one on the other; when these had made three good leaves each, we should pinch off their tops also, and three shoots will be produced from each; by looking to the directions these take, we shall observe what to do with them. We want them, of course, to point outwards, and at equal distances; but we may remove altogether any one that grows awkwardly, or does not help our form, and only retain such as answer our notions of what the head should be. During the whole season of growth, we should watch the progress occasionally; because, if well managed, there will be a good strong growth before the end of the summer. In the next pruning, we may pretty well shorten every branch to two eyes; and when these start, observe which will make the branch best suited to the intended form of the head, and only retain that; or if both seem required, keep both. This second year's growth will enable us to form a good head, because the wood will be stronger; and on pruning this second year's growth, we may leave the limbs or branches somewhat longer, so as to form a good head. Instead of cutting back all the branches to any particular number of eyes, we may look more to the length and situation they are to occupy, to help out our plan of the head, than to any number of eyes. Generally speaking, the eyes nearest the end grow strongest; but when all the buds begin to grow, every one that grows inside, or points inside, and all that are not wanted, must be rubbed off before they advance, that all the vigour of the tree may go to the branches allowed to grow.

Nothing is worse for a rose than a confused mass of branches crossing each other. The inside of the head should be as clear as possible—no branches crossing each other, no small weakly shoots filling up the space. Watch, also, the stock; for if a

shoot of the stock begins to grow, and if it has a week or two to thrive, it injures the head beyond all calculation and belief; and whenever you have to remove a shoot from the stock, take it off so close as to leave no buds to shoot again. When a rose-tree has got over its second year's growth, and got into a pretty good form, it only wants the usual annual growth for a short time to make it as large as we desire. But this can be achieved the third year well by only leaving the under branches rather longer than we might if it had arrived at the size we wish it to attain; because, that once reached, the pruning of a rose becomes a straightforward affair. We have simply to cut out all weak shoots clean to their shooting-place; then cut close every snag that may have died back past the last eye; to remove all branches that grow under the head, and tend to thicken it, or make it confused; and to cut clean out, instead of shorten, every branch that is not wanted; for, inasmuch as many new shoots will start every year from the old wood, the head would soon be choked up, if they were not all cleared out; and it is of the greatest importance that the cut should be clean and close. Nothing has tended to kill a great many roses, and damage more, so much as leaving snags and spurs, which constantly die back; and the mischief goes sometimes further: so that, at each yearly pruning, every roughness, spur, snag, and dead branch should be taken as clean away as if it had never been there. The form we should aim at in the head of a standard, should be a globe, with the lower third cut off; and a figure of this kind would shame three-fourths of the standard roses, which are pruned, year after year, to the form of small mops, or birch brooms, stuck up all over a ground, and more or less unsightly in every respect, according as there are a greater number or fewer of them.

Rose-bushes are, for the most part, roses on their own roots, and not worked, or they are roses worked so near the ground as to be the same in effect. The pruning of these consists in keeping them down; for bushes would be more unruly than standards, if neglected. The wood below soon gets bare and unsightly, chiefly because the branches are, if let alone, soon too thick, and rob one another of air and light. We should begin a rose-bush by cutting away everything but two or three eyes; or if there be already two or three healthy shoots come from near the ground, cut away all but them, and shorten

them to three or four inches. When they begin to shoot at their eyes, rub off all but two each, and choose two that will grow in the best direction to form a good bush: do not let them cross each other, nor grow inwards. The growth they will make the first year will astonish any one strange to the subject; but the second year, these branches must all be cut down to two eyes each: and as some of the branches from these would be in the way, it may be found necessary to rub off one of these; for the same rule must be observed as to crossing each other, or growing inwards. The only exception to this close pruning must be where you wish the bushes to fill up any particular space; but as they are left their full height all the winter, and after spring-pruning soon make rapid progress to get to their full growth and bloom, it is generally advisable to keep them down as much as possible in the pruning, more especially as it greatly strengthens the shoots, and increases the size of the blooms.

Climbing-roses require peculiar management. They will frequently appear to stand almost still for a time, and all at once a shoot will make its way to the full length of the space the plant is to occupy. The old plant may be cut down to pretty near the ground, as soon as a healthy shoot from the bottom appears, because the long shoot takes the principal strength, and ought to have it all, for the bush could not move. Let other shoots go up as they will; but as soon as any one gets the full length it is wanted to go, take off the top, and induce side-shoots. From year to year these pillar, or climbing-roses, require the same clearing of dead wood, the same removal of weakly branches; and every spring, when the buds move, they should be thinned by rubbing off all that are in the way, or useless. All side-shoots should be cut to the length they are required to hang or stand out; and much may be done according to the habit. If it may take up considerable room, lessen the number of shoots, instead of shortening them; because the object in climbing-roses is not so much size of bloom, as quantity and succession of flowers. But we may always conclude, that if we buy climbing-roses in pots, and plant them, hardy young shoots will soon beat the old ones, and then the old ones may be all cut back.

CURRANTS, GOOSEBERRIES, &c.—The pruning and training of currant and gooseberry-bushes is a very simple affair, if set

about the right way when young. It has to be kept in view that the main object is fine fruit; and this can only be produced by abundance of light, sun, and air. Consequently, when the trees are young, they should be cut back, to make them form a sufficient number of branches, pointing outwards all round; these should not be in each other's way, nor cross, and the centre should be kept free of wood. Currant-trees naturally grow outwards and upwards; many gooseberry-bushes grow outwards and downwards. The former would form the skeleton of a basket, the latter the skeleton of an umbrella. When you have once shaped your skeleton, as it were, to your mind, your winter-pruning is only cutting back all the lateral shoots to a spur or stump, with one growing bud; so that, after pruning, your tree or bush is the same kind of skeleton; but the ends of the branches are allowed to grow and remain longer every year, until they occupy all the room you can spare, when these may be shortened, or topped, as it is called, to your mind. When the end of a branch is not healthy, you may cut that branch back to the first healthy shoot, which will become the growing end of your branch. If, during the formation of your bush, you find two branches too far off, while the rest are pretty well formed, allow one of the lateral shoots that grow onwards to form a new branch to occupy the vacant place between them; and when a branch becomes unhealthy, cut it back to a healthy part, even if it be close to the base; and from the new wood that breaks out, select the strongest, and take away the others, before they make any growth worth notice, so that all the strength may be thrown into the one shoot selected. By cutting back branches that are getting old or decayed, we may always renew the bush; but in such case there would be a forest of new shoots, and they should all be removed but those wanted to form the new branches. At the first planting of currant and gooseberry bushes, we should take care to remove all the shoots but those which are in a right direction; and if they are not well-formed, cut back so freely that the next year's shoots shall give you all you want; for every eye will give a shoot, and some shoots will come from parts where the eyes are not even perceptible. Perhaps the best way to form handsome bushes is to cut away all but the branches which grow outwards; and if there be only three or four of those, take the ends off to

within a foot of the base. From each of these many branches will shoot; but you have to rub off, while young, all but those you desire to form your bush, and throw all the strength into these. Perhaps two from some, and three from others, may enable you to form a good head that year; if so, you cut off all side-shoots to a single eye, leave the ends to grow longer, and repeat this pruning every winter. Gooseberry may be trained as standards, by encouraging the upright growth of the first shoot, and cutting off all side-shoots close to the wood, until the main stem is as tall as wanted, when, by pinching out the top, a head will be formed in two seasons, the same rules being observed as to pruning as if it were on the ground. The stems have to be supported by sticks. Both gooseberry and currant-trees may be trained as espaliers, and also on walls, the pruning being precisely the same; but in the training, the lower branches must be horizontal, as nearly as possible, and the sooner this can be followed up with the rest of the tree the better. In this case, only three shoots are wanted on the young tree, one to grow each way, in a horizontal line, the other upwards, to produce other branches. The upright shoot may be cut back to eight or ten inches. The upper eye will do for the next year's upper shoot; the next eye on each side will form two more branches to train next year, and all below ought to be rubbed off. If the branches are thus laid horizontally, seven or eight inches from each other, they will bear fruit the whole length that they are trained, all but on the present year's wood, which does not bear till a year old. On walls the training is the same; but as the fan form is much easier to some people, and covers a wall quicker, you have only to lay the branches of your skeleton tree so as to cover well, but out of each other's way; and every winter, or early in spring, cut every side-shoot back to a single eye.

THE VINE.—The vine bears its fruit on the last year's wood; and the great object of the cultivator is to get that wood well ripened, for on that depends a good deal, if not everything. The quantity of ripened wood of the last year to be left on a vine should be so regulated, that it may be distributed over the surface of the wall, roof, or house occupied by the vine, at such distances as will insure a good scope; and this may be done two different ways: it may be by leaving shoots to go up the whole length of the front, or space, at proper dis-

tances,—say eighteen inches apart, and so to clothe the space, as it were, with new wood every year, with new branches for the next year's crop, and to cut back to the bottom, or nearly so, all the wood that has borne this year; or, when the space is once clothed with branches, to let shoots come all over the vine as near to each other as branches may be wanted, and to cut them back to a single eye all over the vine, which is called spurring it. The former method keeps a vine the most clean, because, as the old wood is cut away every year, and the space clothed with new, the training may always be done to the greatest nicety. In the spurring system, the great object is, to cover the space as soon as possible with strong wood. This may be done after the fan form, or the horizontal form, in the upright plant; and although much has been written and said upon this subject, there is not enough difference in the result to justify a preference on the score of bearing. Generally speaking, with this, as well as all other fruit-trees on walls, some pains ought to be taken to furnish the space well at bottom; because, if that be neglected, we have much more trouble to accomplish it at an aftertime.

The vine grows so freely, that it is desirable, at even an early period of its growth, to take away, before they waste its strength, all the shoots that are not wanted, and all that are weak, so that no more branches are allowed to grow than those best adapted for covering the space, though an extremely vigorous shoot should always be retained, even if in an awkward place; because strong wood is desirable, and the vine is sufficiently flexible to bear a good deal of bending. It is always desirable to preserve a very strong shoot, because it enables us to cut away all that is above of the old wood it grows out of, and substitute the young wood for it. Taking care, then, that we encourage no weakly shoots, and certainly retain none, we have to divide the growing vine, and so arrange the branches as to cover the space, at proper distances, as far as it will go, from season to season; and while we are anxious for growth, we ought not to allow any fruit to swell. We begin a vine with a single bud, or shoot, when we have it for planting. As the remove always tries a plant a good deal, the rod should be cut within three eyes of the ground; and this will throw out three shoots, one to be trained to the right, one to the left, and one straight up. Those right and left must be loosely supported as they grow; the upright

shoot may be allowed to grow upward, slightly assisted, and be retained and ripened, to be cut back as the first was, or it may be stopped as soon as there are three or four joints, and be allowed to throw out side-branches, which will ripen, and be fit to lay in their places, right and left, fan-fashion; and in this way the third year will have made wood enough to cover a large space. Let all the new wood, except that wanted to fill a vacant space, be cut back yearly to one eye, or two if the vine be weakly; that when the eyes break, the stronger may be saved, and the other rubbed off. When shoots come much closer together than eyes can be wanted for next year's bearing, let them be removed young, because all the growth made by branches intended to be taken away altogether, is so much vigour lost to the other branches. A vine can only do a certain quantity of work well: all beyond this distresses it, or at least weakens it. It is as requisite, therefore, to take away some of the fruit, as some of the branches. Every eye that breaks well will put forth a shoot with one, two, or even three bunches of grapes: on no occasion should more than one of these three be allowed to swell. The instant the one bunch is fairly developed, the shoot on which it grows should be stopped at the joint beyond, and the shoot made fast by a piece of list, in such position that it may be sustained properly during the time of its swelling and ripening. Those who are particular about appearances, and wish the vine to be very uniformly trained, may, upon planting the young one, cut back to three or four eyes; and when they break, and commence their growth, save the best on each side to go right and left, and rub the others off. If there be any fruit, let it be picked off at once. These right and left stems, or shoots, are to be trained within a foot of the ground the whole length of the front they are to occupy, and no others are to grow. The next year these two shoots will break at every eye, and you have to rub off all but those which are wanted, which should be at equal distances the whole length of the branches, every alternate, or every third, or every fourth eye, so that they are about eighteen inches or two feet apart, and eyes breaking at the top of the branches. These may be allowed to grow, and be well supported, but with room to swell. If the vine has been well rooted, and in good soil, this second season will fill all the space required with upright branches, or the greater part of it with serpentine branches, according to the fancy of

the grower. These branches will all bear the next year ; and while they bear, others will grow up between them, to ripen for the year after. In the spring, therefore, when the vine breaks, preserve one shoot between the others, to grow up for the next year's bearing, and rub off all others. By this plan, new wood is grown every year. While it is growing, it is merely fastened, or rather supported, in a temporary way ; but at the end of the season, when the old wood is cut away, the new wood is trained into its proper place, and made fast. This part of the business may be executed with some taste and regularity ; but the young wood that is growing all the while the old wood is bearing, need not be too tightly fastened, nor is it of any consequence what direction they are trained, or rather supported in, while growing, the only object being to keep them secure from the effect of wind, and out of the way of the fruit. Generally, they may be grown upright, between the bearing branches. If, instead of renewing the branches every year, we desire to fix them permanently, and prune upon the spur system, the difference we have to make is this : instead of having the buds rubbed off to two feet distance, we make fifteen or eighteen inches the distance ; and the breaking of the vine has to be watched quite as carefully ; because, instead of alternate growth for long branches, we have to merely regulate the new shoots, taking off the fruit from such as are too close to other bearing shoots : to rub off all the shoots except those we want for the next year's spurs, and to allow but one bunch to grow on each fruit-bearing shoot. In the course of the summer, we have constantly to break off those innumerable shoots which come almost all over a vine, leaving none on but those growing into good strong wood, and no more of them than are actually wanted. In training the vine in the house, the system is the same, although the space to occupy, and the forms into which a vine is trained, may be different.

In training and pruning vines for out-of-door culture, after the fashion of vineyards, the treatment assimilates very much to the raspberry. Five or six canes come up, and are grown to any length they please to ramble ; but they are cut back to about six-foot lengths, and supported all round like the branches of a currant-bush ; all the old wood of last year cut down, and, when it breaks, the bunches are reduced to one on a shoot, which is stopped or shortened at the first joint

beyond the bunch. This is the renewing system. The other way, the vine is formed as you please, and properly supported, but all the new wood shortened to a single eye. The grape-vine is, in fact, the most manageable of all exotic fruits. So that you do not allow too many branches to grow, and too many bunches to swell, it will always do well; but all cuts must be made clean and with a sharp knife. All fastenings must be strong. The wood must not be too crowded, and the practice of baring the grapes, by taking off the leaves of the plant, is a bad one. Grapes will ripen and get to a good colour behind the leaves: and to deprive a plant of its leaves is to rob it of nourishment.

RINGING AND ROOT-PRUNING.

Ringling is one of the barbarisms practised by some of our ancestors to promote fruit-bearing, to stop the sap from being supplied in such quantities as to drive the tree to growth. The operation was easily performed. Two cuts have to be made round the bark of the branch to be wrung, at whatever distance you please, and the bark between the two cuts was removed; thus the communication between the severed bark was supposed to be cut off, and it was said the branch bore much better. We condemn the practice altogether. If the tree goes to wood instead of fruit, dig down to the roots see whether they are small, and keep at home; then, if there be any large portions rambling, cut off one or two with a fine saw; you need not trouble yourself to take out the piece—leave it there: it is enough to have separated the parts, and cut off some of the supply; it will have a far better effect than ringling. If the root, on digging down to it, looks healthy and moderate in quantity, make up your mind there is a tap-root at bottom. In this, case you must dig till you can feel under the tree, and cut off the tap, not too close up to the tree or it may be distressed too much. Root-pruning, when done judiciously, is always beneficial to trees. People may call all these things unnatural. They forget that the trees are grown unnaturally; that all our varieties are unnatural; that they are not even on their own roots, but grafted or budded on a stock of too vigorous a habit, and that the stock must be reduced to a sort of balance with the head or bearing part of the tree; and the easiest

mode of doing this is to drive at the roots, examine them, and wherever there appears to be a limb too vigorous, shorten it. There is no occasion to do too much at first; but we have been successful on several occasions, where, after years of painstaking, trees would cover the side or end of a house without yielding half-a-dozen heads of bloom or any fruit. On one occasion, we found one limb of the root go under a gravel walk, and we followed it nearly six feet, but we ran a saw through it about four feet from the tree, and covered it all up again. How much further than six feet the root wandered we do not know: but it settled the business of bearing: the next year it did nothing but produce many short joints of bearing-wood and spurs, and the year after the crop was enormous, but we persuaded the owner to thin them to less than half, and it has borne ever since. Therefore have we decided in our own mind that root-pruning is far better than ringing, which can only be temporary, if it be good at all.

DESTRUCTION OF VERMIN.

The gardener's enemies are not to be numbered; they are like the dust of the roads or the sands of the sea; his whole work is destroyed in a short time by a hundred different means, if he be not on the alert at the proper time to prevent or avoid the mischief. His cabbages and cauliflowers may be eaten into holes and rendered worthless on the eve of perfection by caterpillars, or they may be destroyed at the onset by club at the root; his peas may be stolen by the mice before they are above ground, or taken by the birds when at maturity; his roses may be blighted by the green-fly; his onions spoiled by the maggot; a tree of ripe cherries may be cleared in a morning by a few rooks or blackbirds; his grapes, peaches, and nectarines disfigured by wasps; his plants in the houses may be cut up by the bug, the scale, the thrip, the green-fly, and red-spider. Turn which way he will, there are thousands of his foes ready to commence their ravages the instant he neglects for a day or two any single department of his business; and he has no small difficulty in pursuing his ordinary duties at times when some one or more of these pests threaten destruction to his choice productions, and he is obliged to turn aside to use those remedies which experience

has taught him will soonest rid him of their presence. Nor is it sufficient to use any temporary means; his life, all the summer season, is a life of watchfulness; there is no duty so constant, no attention so unremitting, as the gardener's, and if he neglect but an hour, he feels the effects for an age. If his weeds be neglected awhile, they drop their seeds, and he has work cut out for the next year; and among his numerous enemies in this respect, he may reckon a careless neighbour, or a road-side ditch his worst, for they will sow seeds all over his ground in spite of his care. But our present object is to consider the best means of getting rid of those pests of animated nature which spoil, and often altogether devour and destroy his crops—earwigs, wood lice, ants, snails, slugs, wireworm, grubs, living creatures without end, any of which, left alone for a time, prove endless plagues. Among the most useful implements to aid him in his crusade, we reckon the syringe, the frequent use of which is of immense benefit; for it is one of the greatest disturbers of insects, whether on fruit-trees out of doors, or potted plants under glass. The timely use of the syringe washes them off, and by perseverance will go a long way towards preventing the incalculable mischief that is done by the green-fly that infests all tender shoots of fast growing plants. How commonly do we see a rose-tree clean and free from any living pest, and the next day actually covered with the *aphides!* and if they are allowed to remain, how soon do they suck the juices from the tender stems, and kill the buds that are on them! We know of no remedy for these prolific gentry but tobacco. Out of doors tobacco-water will kill them; indoors, smoking them in the frames will cut short their career. Some adopt a paper or calico covering for any favourite tree or bush, and fumigate them underneath it; for if we can but fill the cap or covering with the smoke, which always rises, and keep it full for a few minutes, the flies will all die, and may be immediately washed off with the syringe. In houses, or frames, or pits, there is no difficulty; two ounces of tobacco, in one of Brown's fumigators, will fill a tolerably-sized greenhouse; but if one of these be not at hand, use a quarter of a pound. Make some charcoal red hot and put it in a flower-pot, then put the tobacco damped on it, and it will burn and smother till the house is full of the clouds of tobacco smoke. We need not say the house should be

closed up so that none can escape, and it is as well to do it in the evening, that it may be closed all night. You will see the dead flies by wholesale lying on the pots, or hanging about the leaves, but not a living one among the whole number, however much they abounded before fumigation. For the red spider a damp moist heat and syringing will do something ; but it is a good plan to strew sulphur on the flues or hot-water pipes ; the sulphurous vapour that arises settles the account with this pest very quickly ; but plants must be watched for this, because if the leaf actually shows the attack by the colour, they have already sustained considerable damage, and by looking often at the under side of those leaves, which are susceptible of attack, a straggling spider or two may be seen, that would become the founder of a colony not so easily routed. Frequently washing the walls of stoves with lime-white, in which a little flour of brimstone has been mixed, is an excellent thing to prevent the red spider, and if a plant has it very bad, it must be discarded from the house, or all the rest will become infected. The mealy bug is one of the foulest looking insects that ever got hold of a plant, and so difficult is it to get rid of, that houses once troubled with them can hardly be cleared by any known means. To clear a plant of it, a good tub-full of tobacco-water should be prepared, strong enough to enable you to taste it,—in fact, about the strength of weak tea. By putting two bars across the top of the tub, and inverting the pot, with its arms resting on the bars, the entire plant will be immersed in the tobacco-water, and in twenty minutes or half an hour the whole will be killed ; but if the plant be too large for this, it must be washed with tobacco-water, and a long band-brush, like a shaving-brush, and this must be performed very carefully or the young shoots will be damaged. Many stove plants are subject to this, and a foul plant put among fifty clean ones, and neglected, will give it to them all. Whether in a very young state they blow about like so much down, and locate wherever they alight, or not, we can hardly tell, but they propagate very fast somehow, and if a foul plant be at one end, some of the cleanest at the other end will soon have them. In fact, this and the red spider are formidable plagues in the stoves and forcing-houses, and if neglected, the plants suffer rapidly. The bug will locate on the most tender shoots and bloom buds, and so get among the tender flower-stems, that

ixoras, clerodendrons, and other plants blooming in bunches will not be able to flower at all, unless the bugs be eradicated before they have time to do mischief. Another mode of getting rid of these creatures is to wash all the infested parts with yellow soap-suds, and a new shaving-brush has always appeared to us to be the best adapted for the purpose. The bristles are just stiff enough to drive them out, and they cannot stand soap if they are disturbed; but even syringing will scarcely move them when they have once taken full possession of all the corners and interstices of a plant. Care must be taken that the suds are not too strong nor too hot, but they are the more effectual for being a little warm. We need hardly say that the plants must be handled very carefully, for it is easy to bruise and damage the young shoots and bloom-buds with rough handling, and in this respect it is impossible to be too tender. The hand must support the leaves and young shoots, which should lie in it, or lean against it, while the other hand plies the brush. By this means the stalks of the leaves are not bent or broken. Some lukewarm water should be handy at the time to clean away the soap, or, which is better, to syringe the plant with after it is cleared of the bug. The scale infests hard-wooded plants, generally, more than anything succulent in its nature, and this scale has to be removed with some gentle violence, for it adheres generally pretty close, and all the syringing the plant could have would not stir it. A stiff brush and warm soap-suds may; but it will frequently be found necessary to scrape it off; some gardeners, as a preventive to this, mix up a wash of clay, thick enough to dry on a thin coating, and it has been found that the scale cannot settle or breed on this; but it has its disadvantages. In the first place, it does not help the appearance of the plant; in the next, it is questionable whether the ordinary organs of the plant can work so freely, when there is a close coating of any kind over the surface; but when a plant has had the scale badly, it may not be amiss to give it a wash of this sort to remain on a few days, while there is a chance of any of the young brood hanging about, and then to syringe it off by degrees, for it will be some time before it is all washed off. Ants are very awkward things in a house; for they will, if in any quantity, often make their colony in a pot, which they work into a thousand hollow ways all among the roots, and the plant is almost destroyed before the mischief is

discovered. Generally, the best way of thinning these intruders is to coax them into one spot, and pour boiling water on them, or to wet their places of rendezvous with strong lime-water; or lay a few hollow bones about, if they frequent parts where this hot-water and lime-water cannot be used, and, having a pail of boiling water handy, throw these bones into it quickly, and thus destroy hundreds at a time. These may be dried again and placed as before, or in any place where they most abound. Where these industrious little creatures can fairly locate themselves, it requires a good deal of perseverance to dislodge them. Of course by pursuing any of these methods earnestly, their numbers lessen very much, and when you find but few, stir the tan or soil, or whatever they harbour in, to disturb them still more, and by this means you will finally dislodge them all, or render them so scarce as to be of no importance. The wood-louse is another ugly tenant of a house, and those among the tan can only be trapped and destroyed. One of the most effective traps is half a large potato scooped out and dried, with a notch cut in the edge. This laid hollow downwards will sometimes trap twenty or thirty at a time; and of course by increasing the number, and laying them about, a larger number will be taken every day. The pail of scalding water to shake them into, is the readiest way of destroying them; but you must not wet the potato. Turnips are much about the same; but neither will entice them till the juicy surface is dried. Toads kept in the house will pretty well keep them under where they can reach; but a toad is not comfortable in warm tan, and it will contrive to get up into one of the pots and bury itself in the soil, so that they are only useful on the floor, where they also make free with any small vermin which invade their territory. Slugs and snails are the most destructive things that can harbour in a house; they are occasionally brought in among the pots that have stood out of doors, for they get into the draining holes, and make a habitation, whence they sally forth at dusk, after the houses are closed, and commence their meals upon the first, and sometimes the best plants that they can get hold of. Many an hour have we lost in endeavouring to find them, often in vain, although we have traced them a long way by the slimy tracks they left behind, and resorted to night work before we could detect them. On this account, every pot that is brought into the greenhouse or stove for the winter, should

be closely examined, and if there be the least sign of any one having been about, and it cannot be seen, the ball should be turned out into the hand for examination, rather than risk the introduction of so dangerous a visitor.

If, notwithstanding all our care, we see a trace of snail or slug on the ground, the walls, brick stages, or shelves, we ought not to rest until we have found the offender; for in a single night it may eat off the best shoot of a valuable plant. Potsherds may be placed about here and there, with the hollow part towards the ground, for the chance of their harbouring them; and if there be any danger of a colony among the pipes, or under the stages or flues, it is a good plan to sprinkle fresh lime rather thickly about; for if it touches them they will be destroyed, and it will prevent them from coming abroad, even if they are not killed by the first application. A fumigation of houses once a month, without waiting for any excessive attack from aphids, is not money thrown away. The smoke is a great enemy to all animal, or rather insect, life; and it has the effect of ridding us of too many flies, moths, maggots, and other living things, that do us no good, and often do harm. Butterflies and moths, in summer-time, often take the liberty of laying their eggs on a plant, and, if the family be not disturbed by some of the washings instituted for other purposes, yield us a goodly race of grubs, which we may not detect until they have done a good deal of mischief. This could often be prevented by periodical fumigations; and although this is not done without expense, it is worth all it costs to be assured of an empty house, and therefore no bad tenants, or at least the extermination of all that cannot live in tobacco smoke; though the mealy bug and red spider are not to be dislodged without other means.

All we have said of houses applies with equal force to hot-beds, pits, frames, and other receptacles for plants; there is no difference in the remedies—all the means of extermination practised in the stove and greenhouse will be equally efficacious in other horticultural buildings; but in conservatories we cannot apply them: all we can do there is to keep the shelves, walls, windows, and all sorts of corners and ledges, well cleaned, and to remove infected plants to the other houses for fumigation; for tobacco smoke will not agree with the company who frequent the conservatory, even if it does not communicate with the house.

With respect to the gardener's enemies out of doors, and their name is legion, we have very different customers to deal with, and much greater difficulties to contend with. So far as ants and wood-lice are concerned, the same means in all respects must be resorted to ; but instead of a stray snail or slug, we have them in large quantities. There is no such thing as tracing a solitary marauder by its shining train—if they plague us at all, they do it wholesale ; and if we do not protect our young peas and salads by some means, they are occasionally lost altogether. A liberal use of lime is of great service, as a preventive of mischief to the place actually guarded ; but we ought to aim at once at their destruction. The best traps for slugs and snails are tiles, with the hollow part downwards, and cabbage leaves ; examine these every morning, and the under sides will give us plenty to kill. These should be laid down again directly, and the next morning be examined again. In a garden neglected two years, where weeds had been left to grow, and all living creatures held undisturbed possession through two whole seasons of growth, we once had to contend with two ripe harvests of weed-seeds, and all the slugs and snails that had congregated and multiplied during the whole time. We burned all the weeds, and buried all the surface soil, roots, snails, slugs, bots, earwigs, and other living pests, two feet deep, and fancied we had at least got rid of all but a few stragglers ; but no sooner did a green leaf appear than it was fairly riddled or gone. We resorted to cabbage leaves, which we procured in the neighbourhood, and laid them thickly about the ground. The first morning the undersides were covered with hundreds of slugs, scarcely thicker than a small straw, besides a few goodly parents : day after day, the numbers seemed scarcely lessened ; and when the leaves became too much withered for use, we procured fresh ones. It would be incredible to speak of the numbers destroyed on half an acre of ground between four brick walls ; and although the cabbage leaves were evidently the tempting food, and we had destroyed tens of thousands by our daily crusade, not a crop could we raise without an embankment of lime, and constantly picking off those that seemed to come up through the ground between the two rows of lime—for cross them they could not, this was a certainty. Perseverance, however, at length reduced the number so much, that we seemed to have no more than the usual share ;

and our cabbage-leaf warfare ceased, for we took up hundreds at last without finding an enemy. We cannot help thinking that these creatures had the power of working their way through a good deal of earth, and that our burying system was of little use. We have since seen tiles used with good effect, but must prefer cabbage-leaves; for they are more attractive, although more troublesome; and they must save the crops, because they are greatly eaten from the first to the last, while the tiles simply tempt those that are near, as a shelter.

If a ditch and hedge form a boundary to a garden, it is one of the worst we can have; for they form a harbour for snails and slugs that it is almost impossible to counteract: the only effectual stop to their intrusion is a sunk or raised trough, the whole length, kept full of water. A ridge of lime is only effective for a short period; it soon loses its caustic quality—and this once gone, a snail could crawl on it as well as over a ridge of common earth; but they cannot get through water. The kind of slug, too, that inhabits the banks of ditches is enormous, as may have been seen of a cloudy evening, when those black monsters intercept our path. One of these could gnaw through a cabbage in a night, or lay a whole row of peas or lettuces under contribution. Costly, therefore, as it might be to make a gutter full of water, by means of a wooden or a zinc trough, it would be the only way to prevent their depredations; for vain would be the task of trapping them, though perhaps a row of cabbage-leaves might tempt them to stop short of any other crop.

Old walls are too often harbours for slugs at the lower part, and snails higher up. Often, too, does the other side harbour them, and they have merely to come down to their feast. This is perplexing, for there is hardly any means of preventing them: a trough full of water at top would have the effect; but if it were not bedded in mortar, and closed on both sides, it would form an additional protection for them, and they would locate underneath it, in a space that would be altogether incredible. Lime here would only prevent them while it retained its caustic quality; and we have been a most unwilling victim to the colonies of these creatures, inhabiting a hundred yards of overgrown ivy, which sheltered them by day, and our peaches and nectarines served them for a feast at night. At length we nailed a horse-hair rope just

under the top of the wall on our own side, and it was an effectual bar to their depredations. This, however, would not stop them on the ground, as slugs would burrow under it, and defy it altogether. It will be seen from this, that unless you can stop their importation from your neighbour's grounds, your work will be endless, and almost fruitless. Your whole mind, therefore, must be set to stop their ingress from parts where you have no control, and then exterminate those already on the premises, by the means we have mentioned.

Earwigs have baffled the exertions of many gardeners ; but it has been chiefly because they were careless until the insects began to be numerous : as a proof of this, we have known dahlia growers to plant out in May, to begin hunting for earwigs as soon as the blooms were attacked in July and August. Now, nothing could be more thoughtless than this, although some of the pretended teachers of the cultivation of that flower actually tell us, that as they advance towards flowering, we must begin to stop the earwigs. It is a thousand to one if they can be got rid of at all, if neglected till that season. Earwigs should be always trapped and killed. For this purpose, hollow bean-stalks, properly dried, and cut into six or eight-inch lengths, should be placed thickly about the borders, close to or in any plants that may be there ; these should be thrown into a pail or pan full of strong salt and water every day, so long as one is to be found in the entire round of the garden. When the dahlias are planted out, or any other plant that they attack, one of these traps should be placed to each ; and, as the insect prefers a snug place above ground to burrowing under ground, and especially in wet weather, they will be almost exterminated during the spring months. The old gardeners used to put lobster-claws on the top of small sticks, and the younger ones put small flower-pots, with some moss in the bottom : all these things are good if examined daily, and all that are caught are killed ; but if they are merely put there, and not examined, they form the very harbouring material which enables the insect to multiply. Better leave even dahlias to their fate, than put pots of moss on their sticks, and not daily examine them, and kill all that are caught. We have, even in the dahlia ground, put the pots we have taken them out of, on the top of the short sticks from the pots close to the plant ; and, although we have not caught one in half a dozen pots, we always felt that we

were destroying a brood ; and, long before blooming time came, we have not seen such a thing in the whole round of pots. But this is not the time to leave off examining, because earwigs fly ; and, as a proof of this, we have seen them actually stuck upon newly-tarred palings and fences, with their beautifully delicate wings fast to the tar, and they unable to release them ; so that we must not relax a single day, if we desire to keep clear of them. A swarm of these on their travels might be tempted to alight where there was anything very attractive ; and if we allowed them a few days' uninterrupted liberty, we might find them increased by numerous families.

In the open ground, there is one very simple means of trapping innumerable enemies. By using a smooth and rather taper rod of iron or hard wood, and making holes in the ground two or three feet deep, we form so many pitfalls, into which earwigs, ants, small grubs, and various insects tumble, and the vast majority cannot get up again. We have known some of these to get half filled with ants and earwigs, for the perpendicular side forms too long a journey for vast numbers, even if any ever reach the top ; and near an ant-colony, it is almost enough to exterminate the whole community, if we make a few clean-sided holes near their haunts. The earwig is not merely an enemy to flowers ; it is destructive among fruits, and it is impossible to be too persevering in the endeavours to get rid of the enemy. Grubs and caterpillars, the larva state of butterflies and moths, are among the most mischievous and formidable of all the gardener's enemies, and this should be thought of while the winged insects are sporting about among the flowers, trees, and bushes, for these lay their eggs in great numbers on the plant that is to sustain the caterpillar or grub, and when hatched, we know the consequences. Some flies lay their eggs all in one place, especially those that take possession of the apple, pear, and plum-trees, where we may occasionally see a web full of the creatures, ready to prey upon the first green leaves ; others, infinitely more mischievous, lay their eggs all over the place,—one fly, perhaps, placing a future caterpillar upon a hundred cabbages. How often has the gardener, to his great mortification, seen a large quarter of cabbages or cauliflowers with scarcely one plant untouched ! and there is nothing so disgusting as either of these productions eaten into and dirtied by these filthy creatures. The quickest remedy is to kill the butterflies and

moths. If one is seen, catch and destroy it at any cost. It would be worth while for a gardener to pay a boy to go round the premises with a regular fly net, with orders to catch and destroy anything that he could get hold of, in the way of wasps, butterflies, or moths, and this at the earliest season, as soon as a white butterfly can be seen on the wing. It is also well worth while to get an intelligent young lad, who could be depended on, to gather up the numerous chrysalises from the wall fruit-trees, gooseberry and currant bushes, walls, and other places of refuge during the winter months, when there are no leaves to intercept a perfect examination, and when, with a quick eye, a lad might almost ensure the taking of every one. Those chrysalises would become so many flies or moths, whose whole business would be to fly about awhile, to lay eggs upon the trees most appropriate for fostering the young grubs, ready for their work of destruction. We may easily conclude, that the extermination of these chrysalises is of the greatest consequence; but this will not prevent those from other places coming into your own garden, and there depositing eggs, leaving you, as it were, a legacy of maggots; and therefore it is necessary to use the fly-nets, and catch every one that comes. Maggots cannot travel far, and if the parent cannot find a resting place, but is caught or hunted away, you escape all the grubs that she might otherwise have left behind.

Wasps are very destructive among fruit; they must be caught and killed; and be it remembered, that the time for this is at the beginning of the spring, when every one represents almost a swarm. When they over-abound, it is almost endless work to catch and kill. Bottles of inviting poison may await them at every place, but however many may turn aside and sip their last sip, the fruit is so much more attractive, that most of them will "pass the bottle" without doing honour to it, and feast upon the next grape, or peach, or plum that offers itself. So common is it to "shut the stable door after the horse has gone," that we ought not to wonder, perhaps, at being told by the teachers of gardening, that when the fruit begins to ripen, we should hang phials of sugar and water, or some other tempting draught, to draw off the attention of wasps, and to catch them. How much more sensible the advice would be to provide these traps when they would enjoy the monopoly of temptation, when in fact every wasp that

arrived within the smell would inevitably be tempted to drink! Why, by the time the fruit was becoming ripe, three-fourths of the depredators would be disposed of. The truth is, almost every body waits for the inconvenience, and then tries to get rid of it, instead of using half the trouble to keep the evil off altogether. Bottles of sugar and water, or sugar and beer, with tolerably wide mouths, might with great advantage be hanging about all the year, for while food that is agreeable is scarce, wasps fly a long way in search of it, and this is the time when, by destroying one, we "kill many birds with one stone." We have no notion of waiting for the enemy to do mischief before we try to get rid of him; we would rather battle with him while we had nothing to lose, and when our traps would be doubly and trebly inviting. Destroying wasps' nests is rather a dangerous sport, but wherever wasps at all abound, good premiums should be offered for their destruction. There would be plenty ready to hunt them out and smother the whole community; the great danger is in leaving some hole open that communicates with the nest, and that we have not seen. The usual way is to stop all but the principal hole up, and to burn sulphur within that hole, all that come are then burned to death, and all that remain in are smothered.

We now come to the grubs, and other enemies underground, the wire-worm, cockchafer grub, the bot, centipede, and an endless variety of maggots. The wire-worm may be thinned a good deal by planting old carrots, and drawing them every morning, when these creatures will be found to have eaten their way half into the carrot, and may be pulled out and killed; this will soon clear a place of the wire-worm; but most of the underground pests are annoyed by a good dressing of wood-ashes; if this be forked in a few inches into the soil, it drives them away for the time, but if on digging a piece of ground any of these things be seen, it is well to set somebody at once to fork it about and pick them out, and then give the dressing of wood-ashes.

BIRDS.—With respect to birds, whose destructive work at seed-time will often lose the gardener a valuable crop, little can be done but some constant means of frightening them, or the best of all possible securities, net-work. There is a great variety of cheap netting manufactured now for the purpose of protecting fruit and seeds against birds, and the use of these will be found

better than anything else : by sticking up a few upright props in the ground about a foot high, and laying the net-work over, the net is kept from the surface ; it does not obstruct the light, nor can any bird approach the seed. Some, however, put a rod of willow, or some slight taper wood, sloping in the ground, and long pieces of paper to flap about with the wind ; some put threads of worsted across and across the bed ; some tie pieces of paper to string, forming something like the tail of a boy's kite, and hang this from one end of the bed to the other, so as almost to reach the surface. But we believe almost everything in time loses its effect : see, for instance, a bird perched on a scarecrow ; what does that say for the efficacy of a stuffed suit of old clothes ? Yet the scarecrow may be seen in many country gardens, and the birds hard at work all round it. We believe that nothing but netting, so placed as to keep birds off, can be depended on ; other remedies may be used sometimes with success, but occasionally, without the netting, they fail, whether in preserving seed or fruit : netting keeps the intruders at a distance. There is now a sort made, called hexagonal netting, so fine as to stop a fly, and yet light and lasting : this may be used against walls, or thrown over trees, or in any situation where flies and wasps are troublesome, because it is only a little coarser than a lady's veil, and the same make. This forms a most impenetrable barrier against the smallest insect that flies, and if it be fastened so that nothing get behind it, we are quite sure nothing will ever get through it.

We have said nothing of hares, rabbits, and other larger animals that plague the gardener, for there are only two ways of managing them ; the one is to keep them out with a wire fencing, the other is to trap and shoot, or otherwise kill, any one that can be sacrificed. If rabbits burrow under the wire-work, their holes are soon detected, and they are easily trapped ; and unless the garden is in the neighbourhood of a warren, we have generally found that a dog and a gun would keep them tolerably well under.

MICE must be caught or poisoned, and the most effective is plaster of Paris and oatmeal ; they eat it greedily : the plaster sets solid inside them, and they trouble us no more. Many poisons would answer the same purpose, but scarcely any animal will touch the plaster but rats and mice, so there is no danger of poisoning dogs and cats. No wet must

touch it, and it must be renewed every day till the work is done.

We believe we have gone through our list of the principal pests to which the gardener is subject, or at least such as require remedies that will apply to all ; and when it is considered that these are constantly at work, to the detriment of something, and that the gardener, besides all his ordinary labour, has to counteract their mischief, the subject, extensively as it has been noticed, is scarcely second in importance to any of the subjects which have come under consideration.

PROPAGATION.

There is not a more important branch in the whole science of gardening than that which comprises the various means of propagating plants. It is true that vast numbers are raised from seed, our culinary vegetables especially, and the great mass of plants, carefully raised,—that is to say, raised from seeds carefully saved,—come near enough to the original to be considered the same for all useful purposes ; but it is necessary to keep in mind that though in such matters as culinary vegetables, which are grown by acres, and also in the case of ordinary annuals, which are lost every season, we find carefully raising the seed from the best plants keeps up a supply close enough for all useful purposes, there is no dependence on seed producing the individual kind from which it is saved ; the produce will not be the same in every respect, and this is best known by those who save the seed of a variegated holly, which will produce the original green sort ; or the pips of an apple, which will produce the original crab, or something very like it. Then, many plants will not seed freely ; accordingly, to propagate the identical novelty which we may have obtained from seed, and which differs from all we have already, or to increase any plant that we have procured, we must resort to some of the many different plans for propagating from the buds, or wood, or shoots of the individual plant. In the case of annuals, which come from seed, bloom perfect, then seed and die, we have no alternative ; and therefore all we can do is to save the seed constantly from the best, where there is no other of the same family, but of a different kind, blooming, and so keep our seed as good and as true as possible ; but with perennial

plants, shrubs, trees, and bulbs, where there is any peculiarity or excellence to perpetuate, we cannot depend on seed producing the same, even if we can procure it, but must resort to other means. These means are, first, layering, which is inducing side branches to root in the ground, independent of the parent, and then cutting them off; offsets, which are side-root shoots, which in time separate themselves, as in the case of bulbs, tubers, and suckers, which make an effort of themselves to increase; grafting, which is attaching a piece of a branch to a stock, or wild tree of the same family, or something allied to it, but more plentiful; budding, which is attaching a bud of the tree to be propagated to a wild plant or stock that it will grow on; by cuttings, which is inducing a piece of the tree or plant to be propagated to form roots for itself; parting the roots, which in some plants continue to spread out so that pieces may be detached with part of the plant; by eyes, which are small pieces of the wood of the plant with buds on each, &c.—all of which plans would have to be adopted in the increase and perpetuation of the various races of plants cultivated in even a moderate-sized garden.

LAYERING.—One of the most natural means of propagating almost all kinds of trees, shrubs, bushes, and hard-wooded plants, is that of layering, which may be easily understood, when we notice that on taking up an old shrub, that has been growing for years on the spot, the bottoms of many of the branches that happen to have been covered have emitted roots, and that, by cutting off close to the old one all such as have rooted, we make so many new plants. This merely shows that if the branches of many different trees be bent down under the surface of the soil, they will in time throw out roots, and when they have done so, they are capable of supporting themselves if cut off from the parent plant. Seeing then that time will accomplish the object without any means being used beyond fastening them under the surface, and that without taking any pains whatever the shrubs and bushes will of themselves furnish young plants by the mere operation of self-rooting where accident has covered the bottoms of them, all we have to consider in the process of layering is to use means that will hasten the emission of roots, and take pains to subject as many branches as possible to the operation.

Layering is used in propagating very many choice shrubs. Rhododendrons, azaleas, andromedas, magnolias, and other valuable ornamental subjects, are for the most part propagated by layering, some striking roots into the ground more readily than others, but all rooting fit to be taken off in a single season. Let autumn be fixed upon for the layering, and the next autumn the rooted portions may come off; according to the nature of the shrub, whether it be free-rooting or otherwise, so pains must be taken or otherwise, to promote the desired end. Let us suppose that a currant-bush, with four or five long branches to it, were to be layered, we should require to get a long peg with a hook to it, like a small hooked walking-stick, say six inches long; bind the branches down to the ground, and at the part that it can be made touch, but as near as may be to the old tree, make a portion of the soil loose, so as to let the part of the branch down an inch under the surface, and with the peg fasten it by thrusting it into the ground low enough to make the hook hold the branch firmly down, the end being above the surface, and if it cannot be made to stand out of the ground well without, let there be a stone or something to hold it out: the proper method of layering being to make the branch dip, as it were, under the surface two or three inches in length and come out of the soil again. In this simple way the branch will be induced to root strongly at the place where it is pegged down, and the more sudden the bend, the sooner will the branches emit their roots. We have mentioned the currant-tree because it roots freely, but there are others which require something more; and generally speaking, those which will root so freely by merely pegging down the branches under ground, would also strike freely if cut off and planted; but it serves to show the nature of layering, because many that, so served, could not root under two or three years, may be made to strike root earlier by various means.

The principle upon which earlier rooting is promoted is that of lessening the nourishment which the branch receives from the parent shrub. In some cases, as in very tough subjects, such as the vine, a twist between the parent and the place pegged down, but as near it as possible, is sufficient to hasten the striking, because the course of the sap is interrupted, and the branch is left more to its own resources; and nature is always struggling to supply deficiencies, consequently

the branch, being curtailed of its usual nourishment, will make an effort to supply the deficiency. But there are many ways of intercepting the course of the sap; in some cases, by cutting the wood or branch half through by a notch; but this would often lead to the fracture of the other half when we attempted to bend it, so that it is generally made a work of some nicety. The best way, perhaps, is to find, by bending down the branch, where it will best dip into the soil; and at this place, with a sharp knife cut a sloping cut into the wood, and gently incline the knife, so that in a cut of an inch and a half we may get nearly, but not quite, to the centre of the wood, and this should reach a joint, or place where there is a leaf; but the knife must go a little further, say an inch past the joint, and the wood shaved up below the joint must be cut off close to the under part of the joint. When the earth is loosened, and a peg put in to hold the branch down, the joint naturally opens out a little way, and the branch, deprived of one half its nourishment, but not of all, will live, but not flourish much, until it shall, by emitting roots at the joint, make up for the deficiency of its natural stimulant. It is the practice to layer many hard-wooded plants. Roses also, when growing on their own roots, may be layered. Moss-roses are commonly layered for propagation; and every shrub or tree that throws up suckers from the root will always root quickly on being layered. Climbing plants root in general so rapidly at the joints that layering is done without any cutting. There may be a complete length, or shoot, laid along the ground, and a stone laid on every joint, or the joints all pegged down; for they will, for the most part, root even on the surface. The proper mode of treatment, for a preparation for layering, is to plant out the subject, whatever it may be, in a place convenient for the operation. Cut back the shrub pretty close to the ground if it be very young, but if it be an established plant, and the branches can be layered the first year, be it so; but all the branches that cannot be layered must be cut back close; then layer the branches, in the way we have described, all round. While the old branches are growing and taking root, fresh branches are springing up for layering next season. When the branches are layered they ought not to be more than three or four inches out of the ground; therefore, in rhododendrons, azaleas, andromedas, deutzias, laurustinus, hardy heaths, lilacs, ribes, and any

other shrubs which have a neat head at the end of the branch, layering should be done as near the end as will allow of the head forming the plant at once ; and this especially applies to rhododendrons, and all others that bloom at the ends of the joints.

Many ornamental fruit-trees are propagated by layering. Any plant that emits fibrous roots in abundance can be always layered, although this habit greatly facilitates the striking of cuttings ; but the advantage of layers over cuttings is that we can make a much larger plant in a season ; and indeed in many cases a plant is fit to put out, where it is permanently to stand, at the end of the first season, where a cutting would be almost insignificant although firmly rooted. Many plants will root when layered, that would not, with ordinary means, strike freely as cuttings ; and some will not strike at all. Layering is therefore a desirable operation with a very large portion of nursery stock ; and those who have choice shrubs in plantations should always turn to account any branches that come near the bottom, by layering them in the autumn ; for they would be able to take up the next autumn duplicates of many of their best plants. Where shrubs have been growing for a considerable time among others, and there has been a great fall of the leaf, many of the branches will be found completely earthed up, as it were, with the accumulations of leaf-mould ; and it is these branches that will in many cases be found already rooted, especially *laurustinus*, *Pyrus japonica*, azaleas, hardy heaths, and such like ; and in taking one of these old plants up to remove, it will be found that we can take off numerous rooted plants, which have only to be pruned and planted out. By pruning we mean, cut back pretty well to the ground, because it is clear that, although they have rooted, they have always had the assistance of the parent plant, and therefore, when entirely separated at once, they would not be capable of supporting all the growth that they had made while on the old plant ; and that, with such a sudden check, the less they have to support, the better they will succeed. The self-made layers are generally good plants ; but the spontaneous rooting of branches which grow from under the surface, or by their own weight press down to the ground, could not be depended on for a supply ; and the plantation of stools, as the parents are called, for the purpose of layering all the available branches year

after year, is quite necessary where a supply is wanted. Every season then furnishes the rooted plants layered the year before, and a new set of branches to be layered for the following year's supply. But layering is not confined to shrubs: carnations, picotees, and even pinks are propagated to a considerable extent by layers; and there are very few plants which have sound stems, that keep alive through the winter, but what could be propagated the same way. The operation is similar: at a proper distance from the top of the branch, say three or four joints down, or even more if the joints are close, the incision is to be made on the under part, half an inch below a joint, and the knife is made to approach very near to the centre of the stem, and to pass the joint upwards; the portion severed below the joint is then cut close up, the earth stirred an inch or two below the surface, and mixed with a little sand; the branch is then pegged down so that the cut portion is half an inch below the surface, and well watered immediately. The plant, in fact, must be kept moderately moist until the layers begin to grow and root well. In a few weeks it may be tried whether the layers have rooted, by withdrawing the peg and trying gently to raise the layer. This must be done by a delicate hand, because, if roughly tried, young fibres just starting might be broken. But many of the bottom shoots of the pink, picotee, and carnation, are found too short to layer at all. These then have to be cut off and struck under a hand-glass. There is much difference of opinion as to whether a layer or a cutting is the best for growing and blooming; but practice among the best growers has long decided that all the shoots that are long enough should be layered, and all those that are not long enough should be cut off and struck. The same principle that rules with regard to shrubs rules with these hardy perennials; it is by lessening the nourishment from the plant that we drive the layer to supply the deficiency by making new roots; and the principal care that we have in layering is, not to leave the portion attached to the plant less than half the thickness at any one place, because it would endanger the supply; at the same time, it ought to be cut very near to half the thickness, or the plant would not miss the supply, and consequently not make any effort to support itself.

Many plants form their own increase by striking root wherever they touch the earth; the strawberry, for instance,

sends out its own runners, which at once strike root into the earth, and every joint becomes a new plant; while the verbena, at least many of the varieties, trails along the ground, and at every joint strikes fresh roots. This habit is aided by pegging down, because it prevents the wind from blowing the branches about, and tearing out the young fibres before they are strong enough to resist the violence. Some florists layer pansies, others will layer the chrysanthemum; but whatever will strike freely as cuttings ought not to be layered; first, because they are no addition or improvement to the appearance of a plant, but the contrary; and secondly, because cuttings are to be taken from plants without injuring them, and be struck under a glass, where they will be no detriment to the appearance of a garden. The principles of layering are the same, be they applied to what they may. The sweetwilliam, although so easily raised from seed, can only be perpetuated by layers or cuttings; and layers are by far the safest and best. The sweetwilliam, if double, or more than usually fine, always supplies a sufficient number of bottom shoots to enable us to propagate that particular kind; and the operation is to be conducted just like the layering of carnations and pinks; and by this means we might, at any time, multiply a favourite variety to any extent. A mule dianthus, twice the size of a sweetwilliam, but with much of its habit, is so increased; and we have no doubt that much might be done if we simply selected the best out of a batch of sweetwilliams and layered them, to perpetuate the sort, while we as carefully saved their seeds to improve on them, that we may go on layering the best again; instead of which most people rely entirely on seed, and allow the best after blooming to perish, as they would an annual. Layering, in fact, enables us to propagate many plants which it is very difficult to strike as cuttings, and which, being easily obtained from seed, are seldom improved. But a great majority of valuable trees and shrubs are propagated by grafting, budding, and other means.

OFFSETS AND PARTING THE ROOTS.—All kinds of bulbs, as the tulip, hyacinth, crocus, shallot, and such like, and many sorts of tubers, as the ranunculus, anemone, potato, Jerusalem artichoke, rhubarb, and similar plants, and many fibrous-rooted plants, like herbaceous perennials generally, will, if left in the ground long enough, spread themselves to a great

extent, and on being dug up will almost shake to pieces. Many sorts of bulbs and tubers separate into perfect bulbs and tubers for other plants ; with many tuberous and fibrous roots there are numerous complete plants, but adhering to the roots or tubers by trifling pieces, which only require to be parted with the knife, or perhaps pulled apart by the hand. All these rooted side-shoots, and bulbs, and tubers, which have increased of themselves, and only require separating, are called offsets ; but there are other plants whose roots spread, or whose tubers increase in size, without the least effort to separate ; and it is in such cases that we, by the knife, separate the increased size of the roots, or pieces that contain eyes or crowns, which form separate plants on being grown after this separation.

We have already said that time will separate most of these ; but we cannot, in the work of propagation, wait for time. In seven years a plant may spread, and the part which attaches the outside shoots to the main plant might separate of itself. In fact, we have seen, by the process of time, all the interior of a spreading herbaceous plant decayed, and a ring of several spreading plants stretching its way outwards, and when the mass was taken up it would naturally separate into several pieces, but each piece might contain a dozen crowns or hearts of plants, and with a sharp knife each might be separated with a piece of root attached to it, and so form the new plant. But when the object is to propagate the plant rapidly, this separation should take place every season, as soon as the plant is at rest. Polyanthuses, primroses, phloxes, pæonies, rhubarb, many kinds of iris, perennial lupines, hollyhocks, &c., should be parted as soon as the leaves begin to decay, by digging up the plants, shaking all the soil from the roots, and then with a sharp knife cutting through the fleshy parts of the root, so as to keep a piece of the root to every crown ; and these should be immediately planted in nursery beds, to grow into strength for planting out, or they may at once be placed where they are to remain. But as some will occasionally die off instead of growing, it is better to make plantations of plants a year old from planting ; or if the permanent place must be occupied at once, we must separate into several small pieces, but leave two or three crowns to each piece of tuber or root. In respect to bulbs and tubers, such as crocuses, tulips, hyacinths, shallots, and such like, or anemones and ranunculuses, they

have only to be taken up every season when the leaves decay, and the offsets, which form perfect and complete plants in all but size, have only to be cleaned and separated; the larger ones being sorted for replanting or sale, and the smaller ones being kept separate, to be grown into size another year.

Some herbaceous plants spread so rapidly, and the roots meet together so closely, that the patch may be dug up and chopped to pieces with the spade; that is to say, a large patch may be chopped across to make two, or crossed again to make four, or each of these divided to make eight or sixteen, according to the size they are at first, and the size they are required. However the roots may be injured by such rough usage, there is sure to be enough sound to grow again; and therefore, clumsy as the mode may seem, it is very commonly done with rapidly-spreading herbaceous plants. Those roots or tubers of which the plants actually die down every season, such as anemones, pæonies, rhubarb, and the like, may generally be separated into the smallest sizes. They are full of eyes or crowns, which may be easily seen, and the smallest eye forms a plant; but unless it be to propagate a new variety as fast as possible, they are generally only separated into pieces of sufficient size to form a good plant the first year. There are other roots or tubers, which do not show the least appearance of an eye or growing place until the spring actually sets them growing. These are capable of being propagated by parting the roots or tubers, but the work cannot be done with any certainty until the eyes shoot out into growth. The dahlia is of this description; but the eyes may be excited earlier by throwing the tubers into a hot-bed, without even potting. When the eyes start, the tuber may be cut into any number of pieces, so that there be an eye to each; and each piece may be potted and grown in heat until the planting-out time. Corms, as the solid bulbs of the cyclamen and similarly habited plants are called, do not throw offsets like tulips and hyacinths, but are propagated by cutting the bulbs into pieces, which must have part of the living crown to each to grow from; but it is far more profitable to grow these from seed, which being saved from the plant, and not in company with any other plants of the same family, may be pretty well depended on. Nevertheless, if it must be the same individual propagated, the bulb may be allowed to start a little, to show how much of it

will emit leaves, and then separate the bulb into as many pieces as have growing parts to them ; put these pieces in heat directly, in good rich soil, and you will soon have plants. A bulb will generally divide into four or five pieces when it has attained three years of age ; and, if it grows freely, perhaps sooner. Some plants, to be fine, really require to be confined to one heart. The hollyhock ought to be separated so that only one stem shall grow ; the auricula is separated so that but one heart shall grow, and if more than one appears, the weaker should be rubbed off or taken off, for two trusses of flowers could not be thrown from one plant, in good condition and strength. The polyanthus also should have but one heart and truss of bloom, and is not allowed to be exhibited with more than one.

SUCKERS.—Suckers which come from roots are of the same nature as offsets ; some, however, separate themselves, others require the knife to part them ; but, strictly speaking, perhaps all underground shoots of plants that emanate from the roots, and form roots for themselves, may be called offsets ; but we have treated such shoots when on hard-wooded trees and shrubs, among layers and suckers ; for there are some trees that so abound with suckers that they may be cut off with roots to them every season. Of this the nut, lilac, wild plum, rose, and laurustinus form examples. The only reason, perhaps, for not calling them offsets is, that they want cutting or tearing away from the parent root, whether they are one year or two years old ; whereas most of those called offsets separate of themselves in time. Some tuberous roots will propagate themselves by offsets, and may also be propagated by parting ; for example, the potato : we take up a dozen tubers, and each of these tubers is capable of being separated into two or more pieces, according to the size of the tuber, or rather the number of eyes it has got ; for every piece with an eye to it may be grown, and form a separate plant, to produce the next year a new crop, perhaps as large as the one it came from. The next mode of propagating that we shall notice is grafting.

GRAFTING.—If a man desired to be a good workman at grafting, he might be apprenticed to a whip maker, a fishing-rod maker, or a fancy-stick maker, and learn all that he need know in the actual manipulation of the art of grafting. It is the art of joining two pieces of wood together neatly, and

in such a way as in dead wood bound together would be strong. The difference is in this particular; that, in grafting, it is joining two living pieces of wood, one of which is a branch or the trunk of a plant growing, and the other is a living piece cut from another plant. Whatever join, therefore, is intended, whether a sloping cut merely to both pieces, so that they join neatly and hold together with moderately firm tying, or cutting each piece half through to a certain distance, and forming shoulders to fit each other, or one cut into a wedge shape and the other having a cleft cut like a clothes-peg to receive it, no matter what form or plan is adopted so that it be done neatly and quickly, and if bound up before the sap has time to dry, all and every kind of splice is efficacious. It has only to be done with a sharp knife and a dexterous hand, so that no part of either would be bruised or damaged, and the barks of each actually join the other. So far as we have yet noticed, we contemplate the graft and the stock, which is the plant the graft is put on, as being of the same size; but there is a mode of meeting every circumstance under which grafting is performed.

The objects in grafting are various. One is, to give to a weakly variety of any plant the benefit of a strong-growing root and stem, and thus giving it a three or four years old stem and root; while, if it were a cutting, or layer upon its own root, the plant would be actually older than the root, and, consequently, the supply of sap limited for a considerable time. Another object is, to multiply a new plant which is valuable, by cutting off as many grafts as it will afford, and putting them on stocks of a kind that is plentiful and cheap. A third object is, to change a plant already growing well in its place, from a variety we dislike to a variety we require; by which means we can change an entire orchard, if necessary, from worthless to valuable, or from old to new fruit. Of the many varieties of grafting that have been recommended by different authors, many are whimsical, troublesome, and occupy more time and attention than are at all necessary. The more simple a graft is, the quicker it is done, and the more certain of success; for the sole aim in grafting is to unite the two parts so that the piece grafted on shall immediately be sustained by the plant it is joined to, and that this may be the more readily accomplished, the air is kept away from the join by means of a lump of grafting clay close fitted

on all round the place of union. There are conditions that must be attended to by the operator in grafting :—

First,—The wood of both stock and graft must be so cut as to fit each other closely.

Secondly,—The bark of the graft must actually touch or join the bark of the stock on one side of the join, if not on both.

Thirdly,—The operation must be done so quickly, that the sap shall not have time to dry up before it is tied and covered.

Fourthly,—The graft and the stock must be of similar families or orders, as plants strange in their natures will not join. Generally, the wild and natural kinds of anything make the best stocks ; as the wild plum for all the cultivated plums, the crab for apples, the wild cherry for the improved ones ; but there are many stocks that have been found appropriate, though to all appearance different in their natures.

Fifthly,—The state of the stock and graft should be that of active progress ; the buds should be swelling preparatory to the new growth, but not too far advanced towards bursting.

Lastly,—The air must be kept from the join, or the bark would shrivel ; and if barks were not absolutely close to each other, no union would take place.

We have already said that if the stock and graft are of the same size, which is not generally the case, a sloping cut would be enough, the same as a broken stick would be spliced ; but nine times out of ten the stock is much thicker than the graft, and then some other method must be adopted ; one mode is to cut the graft to an angle, forming almost a triangle, except that the bark of the graft must form, as it were, one of the three sides ; then cut an angle into the stock to fit the graft, and bind it, so that the bark of the graft exactly touches the bark of the stock, and in fact fills up the angle. Another way is, to cut a flat side, sloping a little, perhaps, near the top of the stock, and then cut a flat side to the graft, by shaving half away for three or four inches up. Now, as the flat part of the stock will be three or four times as wide as the graft, the graft must be firmly tied to one side of the flat in the stock, so that the bark of the graft shall touch and join the bark of the stock ; for, though it may appear strange, the graft will grow and fill up all the flat part in time, and be as firm as if it had been originally as large as the stock itself ; but if

the graft should be shifted in the binding but a hair's-breadth away from the bark, so that the two barks do not meet, failure is certain, for it will not join to the plain wood of the stock. Very small grafts may be put on to very large trunks, and do well, by splitting out a knife-shaped slit just through the bark, and cutting out a knife-shaped wedge in the stock; only keep in mind the touching of the barks, or you fail to a certainty. It is only in grafting old trees to change the sorts that this plan is necessary. By attending to the conditions before given, there will be no difficulty in succeeding with a graft, and the advantage of grafting may be estimated, when it is considered that a pear or an apple-tree found to be good, might be grafted on a hundred crab stocks, and in one year become a hundred trees, identically the same as the one the grafts were taken from. But grafting is not confined to fruit-trees. Every kind of shrub, stove, greenhouse, or hardy, may be grafted. The newest and best rhododendrons may be grafted on the common ponticum, which, if already established in the ground, and doing well, would cause the new sort to grow most vigorously. All the fancy thorns could be grafted on a common hedge. The finest azaleas may be put on the oldest and worst, if the proper conditions be attended to. The vines in a hot-house may be changed in a season, for the entire vigour of the established plant would be thrown into the graft, by which means the Black Hamburgh grape of the last season may be converted into the Muscat or Frontignac of the present, or the Sweetwater of the present be changed to the Black Prince of the next. There have been recommended far too many ways of grafting, as if the more ways there could be found of doing the same thing, the better instead of the worse for the learner. The most simple are the best and the most certain.

INARCHING.—Grafting by approach, or, as it is also called, inarching, is the art of uniting the branch of one tree to the stock of another before either are separated, for the graft is half supported by the parent plant while it unites, and therefore, there is no risk of losing the graft. In this operation, we have simply to cut, or rather shave half way through the branch intended to be grafted on the stock, and to shave the stock in like manner to a flat place wide enough to receive it; the two are then brought together and bound firmly, taking especial care that the barks meet: by bending the two a little,

the flat parts come together quite close. The manner in which this is accomplished, is by bringing the two pots containing the plants close together, and so fixing them that they may be tied, and remain undisturbed until they unite. By this means a much longer branch may be put on a stock than could be put if separated from the parent stem, because when separated the graft much depends on the very limited supply of nourishment that could be derived from the stock, and, unless very small, would perish for want of sustenance; whereas, when on the parent plant, although a portion of the branch is shaved half way through, a sufficiency of nourishment to prevent its even flagging, comes from the parent root, while the stock supplies the rest that may be sufficient to cause the union. When this union has taken place, the portion of stock above the graft is cut off, and the portion of the plant from which the graft is taken is separated below the graft, which graft, being now on the stock, forms a new plant of the variety wanted. This operation is mostly performed on camellias, every branch of a plant wanted to be propagated being inarched on a separate stock, so that half-a-dozen plants are made of one, and the plant, in another year's growth, is the handsomer for being cut back; but grafting with the grafts separated from the plant makes the same quantity of wood do for many more stocks, because a small piece of wood and a single bud will be sufficient for the graft. This is frequently done with choice kinds, and the easiest way of doing this is to cut a stock down pretty close to the bottom, to cleave it in the middle, cutting out some inwardly on both sides, so as to form a slit the shape of a **V**, then to cut the wood of the graft the shape of a wedge to go into it, with the bud just above, and this being neatly tied with bass or worsted, and covered with grafting-wax or clay, as high as the bud, will make a good shoot in one season. By inarching, therefore, we get a tolerable plant in one season, but by cutting the branch so inarched into as many pieces as there are buds, we should get so many more, but smaller plants. This applies to all hard-wooded shrubs, rhododendrons, azaleas, camellias, correas, and many other choice subjects, and the practice is regulated by the value of the subjects to be increased. In grafting fruit-trees, the stocks are prepared according to the kind of tree required; dwarfs for the wall, for espaliers, or for bushes, are cut close to the ground, that is, within six inches or a foot of the root,

because they are required to branch out close to the ground, and in some kind of standards the trunk is required to be of the new wood, and these must be grafted equally low. In other kinds, the stock is made the height of the intended trunk, and the graft is put on the top. Where the new plant is scarce, and of weaker growth than the stock, they are always grafted at the height that the head is required, as roses on briars, cytisus on laburnum. So also when fine heads are required soon, as in thorns, mespilus, or double-flowering cherries, peaches, and almonds, the stocks of all these being the commonest and most wild and natural sorts, and the heads making themselves at once. In all grafted subjects the stocks must be prevented from shooting, for a very few weeks' growth of the vigorous stock would so rob the graft of its nourishment that it would cease to grow, and finally cease to live. All grafted trees and shrubs, therefore, require to be examined once a-week at the least, and every shoot from the stock cut off so close to the trunk as to prevent them from shooting again in the same place. In the same manner, all growths from the root must be cut off below the surface, not merely cut down, for suckers will come up in greater plenty if they are only cut off at the surface of the ground. When the union has taken place, which may be known by the growth, the ties and the wax or clay should be removed, and the growth regulated. If it be naturally in branches, remove any that are too close and in each other's way, so that only such as are in a right direction to form a head be left. Any vigorous shoot that seems to take all the growth to itself may be shortened back to three or four leaves; and if, as is very frequently the case, the graft makes one leading shoot, let it be shortened to three or four leaves or eyes, that it may be forced into lateral shoots, for the first season's growth ought to be in a right direction.

ROOT-GRAFTING.—Grafting, however, does not necessarily confine itself to operations above-ground. Tuberos-rooted plants are often grafted on the root, or tuber. The dahlia will graft easily by taking a cutting from a choice kind, and first cutting a slope or a notch in a blind tuber, then forming the cutting so as to fit it, gently binding it in its place, and planting or potting it below the surface. The cutting will, if well done, continue to grow as if it were on the parent plant. The ipomea, also a tuberous root, will readily graft. A choice

kind has thus frequently been propagated rapidly. Root-grafting is also practised on roses and many other subjects, the only difference in the operation being the cutting of the stock off below the surface, and the cutting of the rose being grafted to the root. In the autumn or winter, or very early spring, when we dig among the roses, we find abundance of suckers, and we may get them up with plenty of root attached. Cut off the sucker, and take the roots while they are moist; either slit the root, and put the rose-cutting in like a wedge, or cut a long slope to the root, and a similar slope on the ripened wood of the cutting. Make them fit properly; tie them together, and plant the graft below the surface. All this must be done before the root has time to grow; and very few, if any, will miss.

CLEFT-GRAFTING.—The best graft for the vine is a cleft-graft, as it is called; that is, the stock of the vine is split, and the inside shaved out to admit the graft, which is to be cut in form of a wedge, to go into it, the binding and claying, or waxing over the place of union being the same as for other subjects. But another method has been practised with success, even while the vines are growing. Select a vigorous shoot of the vine near the bottom; get a vine of the sort required growing in a pot; shave out a piece to make a flat side, pretty nearly half-way through the new shoot, which should be about the same size as the shoot of the old vine, which must be cut or shaved away to a flat side, so that the two may fit when brought together. This done, the pot should be so fixed as to enable us to bring the two flat sides in contact, and let them be neatly bound together with worsted. The end of the old vine-shoot must be pinched off, and the new one will take up the growth. After a while, it will be seen they are united, and then the pot may be dispensed with, the graft being cut from it, and left on the old plant, which should now be cut back as much as it can be with safety, to throw all the strength into the new shoot. Mr. Towers, we believe it was, who averred that he had known a growth of ten or twelve feet. The new shoot has to be carefully supported, that it may not be damaged by its own weight. To show how certain an operation grafting is, when properly done, it is not uncommon for trees to graft themselves. That is to say, it is a very familiar occurrence to see, in a tree which has been blown about by the wind, two

branches which have chafed each other till the bark has been rubbed off, actually united in a firm graft. When both the stock and the graft are just in good order, that is, almost ready to burst their buds, there is very little trouble and uncertainty in the operation ; but a wrong stock, a perished graft, a bad fit, a slow workman, or the omission of any one of the necessary conditions, destroys the chance of success, and must end in disappointment. It is well worth while to see a man at work at grafting, if it be only to get a practical lesson, for seeing the operation well performed once will be of great service, although if our directions are attended to, there will be little difficulty.

The grafting of roses is not so certain an operation as many other subjects, because there is a soft pith in the middle of the wood, and the brier partakes of the evil. The French people, however, do perform the operation occasionally under particular circumstances. Established briers, which have been budded the season before, and the buds of which have failed, tempt us to try the experiment ; and the wood to be pruned off choice varieties, offers us the opportunity. The best chance of success will be under the following plan of operation :— First, cut down the brier to the top live shoot, in a sloping direction, the bud, or branch of the brier being at the top of the slope. Next, as there is pith in the centre, split down the lowest side of the stock an inch or two, and, with a very sharp knife, slice out a small piece in an angular direction, leaving an angular vacancy. Cut the wood of the graft, which should be strong and well-ripened, to fit on the place cut in the stock, so as to bring the bark of the graft and the bark of the stock together. Bind this well in, and cover with grafting wax, to keep away the air and the weather. In cutting the graft, let there be one eye below the top of the brier, and one or two above it. At the season of growth, the top eye or branch of the stock will grow, and draw the sap past the graft, because it is in the highest side of the sloping cut, and the graft will, probably, shoot at all the eyes, though we have more than once had the graft taken and the top killed, while the object had been accomplished by the eye below the top of the stock being saved. We have mentioned the advantage of sharp knives in grafting ; but in rose-grafting it is so absolutely necessary, that nearly all the failures may be attributed to the bruising of the wood, which with even a moderate

knife is inevitable, so soft and spongy is the wood of the grafts, and so difficult is it to make a clean incision in the brier.

Stocks.—The stocks for grafting may be always raised from the seed of the wildest and most vigorous kinds of the plant that is improved. Apple-pips will produce apple-stocks; pear-pips will produce pear-stocks; and although the finest varieties of our fruits of all kinds have been procured from the same means, we may always see, among a quantity of seedlings, which are the wild and which are deviations that afford a chance of a new and good variety. But, strange as it may appear, nature will assert her right, and the tendency of seedlings to go back to the wild sorts is almost universal. Hence, thousands of subjects may be raised from seed, and scarcely any one be an improvement; while the great majority, perhaps nine out of ten, go back to the original, or thereabout. Sow seeds from the Ribstone pippin, and you have crabs; sow pips of the Gansel's Bergamot, and you have a wild and scarcely eatable pear. Peach, nectarine, and plum-stones will make the best stocks for their several purposes. Cherry-stones will give us plenty of wild cherries: any improvement, any deviation, is the exception, not the rule. But from the seed-bed we may fairly watch the growth; and if there be anything in the habit or foliage of particular plants to justify the expectation of better things, you need not use them for stocks, but let them grow till they speak for themselves. If, indeed, there be anything very remarkable, it may be worth grafting a piece on a strong stock, to hasten the result. All the variegated holly-berries go back, or rather produce the common green one. Even the yellow berries of that favourite variety produce nothing but the common red-berried one that we may see in the woods. And it is upon these wild stocks that the choice varieties are worked; and perhaps it is a right conclusion of some authors, that most of the variegations in the holly are the result of sporting branches, which have been perpetuated by cuttings, grafts, or by budding, which is the subject of our next observations, because nearly allied to that of grafting, having the same object, and answering the same purpose, of propagation.

Budding.—As grafting is the transfer of a branch from one tree, shrub, or plant to another, so this operation is the transferring of a single bud from one to another. By this operation

we propagate a scarce plant to a great extent in a single season, and form a much stronger and more vigorous tree, or bush, or shrub in a year than we could by any other means in a long period. At the base of every leaf when fully grown there is a bud which is an embryo plant. This would become a branch, and if cut off and struck, as it is called,—that is, made to form a root,—it would be another plant, but it would take years to become such a matured plant as we can, by the operation of budding, make in a season.

Budding is performed very generally on plums, peaches, nectarines, and apricots, among fruit-trees, and many hard-wooded plants, and roses are almost invariably propagated by this means. To perform budding well, the bark of the stock should admit of being easily detached from the wood, for it consists of removing a bit of the bark of one subject with the leaf and bud on it, and by slitting and raising the bark of another, and tucking the piece with the bud under it and binding it in, making it form part of the plant it is put on, which it will do in a few weeks. By cutting the other plant all away but the portion which holds this bud, a new individual is formed, and the old one, except as a stem for the new one, is destroyed. The opportunity this gives to propagate new and valuable varieties is almost inconceivable, for the bud forms a head or a perfect tree in every respect like the one it was taken from ; and however coarse the stock may be, the delicacy, the colour, the habit, the properties generally, are alike unaltered in the new plant. Perhaps, so far as amateur gardeners are concerned, the most extensive operation in budding is with the rose. It is a delicate proceeding, and adapted for ladies. Every one who is fond of the rose can obtain a few briars in autumn at any of the nurseries, or of the numerous vendors who constantly employ themselves at that time of the year in obtaining them from the highways and hedges and in hawking them about. They are generally to be had at from seven to twelve shillings per hundred. These should be carefully pruned at the roots, to take off all bruised ends and damaged parts, and also to bring them into a reasonable compass, for they are generally taken out of the ground carelessly, and have often long straggling shoots. These should be planted about eighteen inches apart in the row, and three feet from row to row, and planted with as much care as if they were standard roses, with roots only just below the surface ; an upright stake about every fifth rose, and a slight

rail from stake to stake, to tie all the briers firmly to, so as to stand against the wind, will be sufficient. As these briers grow, all but the top two or three shoots should be rubbed off, that all the strength may go into the useful bunches. These briers require frequent examination, to cut away all extra shoots, which they would be constantly pushing out all the season. In July they will be ready to bud, which however will be easily ascertained by cutting a slit in the bark and trying whether it runs well,—that is, if it is easily lifted from the wood. Then the buds should be sought; those on well-grown shoots of the favourite rose, where the leaves are fully grown, are the only ones that should be used. With a very sharp budding-knife, a slit should be made an inch and a quarter long just through the bark to the wood, within a very short distance of the bottom of the brier shoot, and on the upper side; a cross cut should then be made three-quarters of an inch from the bottom of the slit, and with the thin handle of the budding-knife the bark should be lifted a little both sides all along the slit; then, with the budding-knife, which is kept very sharp, the leaf should be shaved off, beginning half an inch below the leaf with a sort of diving cut, which would make the piece thickest just by the leaf, and the knife should come out again half an inch above the leaf. It will be found that with the bark there has also come a small piece of the solid wood: by holding the leaf between the thumb and finger of the left hand, and lifting the wood at the end that grows upwards with the point of the knife, it can be held by the knife and the thumb and be drawn out. The bark with the bud and leaf can be then carefully tucked under the bark at the cross mark and be pushed down to the bottom of the slit, which will open to let the stem of the leaf pass just below the cross cut, while that part of the piece of bark which is beyond the cross cut, can be cut off there, or else tucked under the bark that is above the cross cut, the bark of the stock being folded over and tied down upon the bark of the bud which will be thus circled, with a piece of bass matting, or worsted, which seems to be the favourite tie now. The shoots of the stock may now be shortened to the lowest side shoot, to check the too heavy draw upon the sap of the stock. Whether one, two, or three shoots are budded, and whether all with the same rose or different ones, is a matter of taste; but the operation with each and all is precisely the same, and so it is all through the rows.

In binding down the bark, the tie must not be too strong, the stem and the leaf must remain outside undamaged, and the work be gone through as quickly as possible, for on that much depends. Damp weather is better for budding than bright sunny days, but if the sun shines hot, let each bud as it is put in be covered with some wet moss loosely laid on over the bud, and while the weather continues hot, let the moss be kept damp by wetting it every morning before the sun is up, at least for a week or two. From the time the budding is done, the stock must be examined, first to rub off all the new shoots, and second, to see that nothing is disturbed; for the shortening of the main branches will induce the stock to send out new shoots, and if this were permitted, the sap would be diverted from its regular course past the bud to the side shoot beyond it, and delay, if not prevent, the union of the bud and the stock. In a few days the mass may be removed, and in a few weeks the ties may be undone to examine the buds, and tied rather more loosely; if the buds seem to have taken, which will be indicated by the plumpness and greenness of them, the growth of the stock beyond the bud may be checked again by shortening the side shoot, and in time, taking it away altogether; but still the stocks may be treacherous, and send out shoots between the root and the bud, which, if neglected, would soon take up all the sap, and deprive the bud of the nourishment it requires. It is not unlikely that the buds, or at least many of them, will push and make considerable growth, and in that case they must be supported, by tying a stick to reach a foot above the stock, and to this the new shoot may be loosely tied, that it may not be blown out by the wind, and all the growing part of the stock must be cut clean away, that the entire strength may be thrown into the new shoot of the bud; but many of the buds will be found perfectly united, and yet make no growth. They are none the worse for this, but the stock must be prevented from growing anywhere, and the bud must wait till the next season.

We have, as yet, only mentioned the brier as a stock; but there are many roses which grow even more vigorously than the brier, and which are therefore used for stocks. All the smooth-wooded kinds of rose, or nearly all, will bud well upon the common China, and it is one of the prettiest experiments in rose growing to bud an old established China rose,

that perhaps fills up the front of a house, with several of these roses. To do this properly, very strong shoots must be selected of the present season's growth, and the buds should be taken from roses of a continuous blooming habit, and of various colours. The dark crimson China is a pretty habit. Some of the lighter varieties of hybrid China may be used. The yellow Noisette will grow beautifully and open freely on the common China, and for the most part, all the small roses on smooth-barked plants will succeed, but the old wood of the China must be cut away as much as possible, excepting the strong shoots that will do for budding at different heights up the house. The common China, which becomes the stock, must be prevented from growing. Budding the small sorts of smooth-barked roses on China stocks is a common practice, and it can be done at all seasons, the China stocks being grown in pots for the purpose, and well established. Many roses which are difficult to grow on their own roots, will grow robustly on China stocks, but they are never used for standards; they are budded as near the surface of the soil as possible, and the China thenceforth must be prevented from growing, either out of the old wood or from the root, for it would overpower any other. The budding of roses is almost a universal practice among those who love the flower, for a bud or two is so easily procured from a friend, and so rapidly becomes a tree or plant, as to reward us for our pains.

The budding of fruit-trees, or shrubs, or plants of any kind, is quite as simple, but there is not the same excitement; nobody cares to keep stock by them, and we are so long before we obtain the result, that it is of a secondary consequence. Shrubs or plants that flower are more tempting, but these we know to be done by the trade, and especially on the continent. With curious evergreens the grafting is far more general. We have by us some curious evergreen oaks preserved for their singular and beautiful foliage, which have been budded on the common oak, and so neatly done that now they have been growing two or three years, the working hardly shows; indeed, if we had not seen them when the budding was more conspicuous, we should hardly have discovered it now. But there is a kind of budding which should be called bud grafting, much more generally in operation with choice plants than either budding or grafting; this con-

sists of taking the smallest bit of wood with the bud on it, and fitting it in the stock : here it joins and grows, and is as firm and effective as ordinary budding. Another way of budding has been practised successfully, but we cannot see the object, except to show the ingenuity of it. It consists in cutting through the bark all round a branch just under a bud, and making a second cut all round just above it, then, opposite the bud make a perpendicular slit, so that the ring of bark is detached from the plant with the bud and leaf on it, a similar cut is made on the stock, and the bark is removed. The bark with the bud is then placed in the space made for it, and tied carefully in its place: the join has to be made very neat at the top and bottom, but whether the stock is larger, and there is a gap at the upright join, or smaller, and a piece has to be cut out, is perfectly immaterial. We, however, always recommend the plainest and simplest method, and in all cases it will not only be found the easiest but the best. In all newly budded trees the new shoot must be steadied by some kind of support, for the wind will very easily blow the bud out of its place if the shoot is long enough to give it a purchase, and nothing can be more vexing than to see our labours, which result in a fine growth that we have been watching for months, destroyed in a single day.

CUTTINGS.—There is nothing more difficult in the whole art of gardening than propagation by cuttings ; yet, to a certain extent, a young beginner will succeed ; and there is hardly a cottager who grows a few window-plants, who is not quite *au fait* at raising plants from slips. The fact is, that some plants are so readily struck, that we are apt to fancy everything is to be equally obedient to our wishes ; and yet a man may expend half his life in learning this branch of propagation. Many plants will shoot out branches from the hard wood, and old-fashioned amateur cultivators of a few greenhouse plants actually wait for such shoots, and consider them lucky opportunities of obtaining new plants : their custom is, when their favourite slip, as they call it, is large enough, to tear it down by the heel, and, without any kind of preparation, to put it in the centre of a small pot, and treat it forthwith as a young plant—and many things require no more persuasion to root, but immediately supply themselves with fibres, and constitute themselves plants. This is no isolated race of amateur gardeners, but includes nine of every ten who

are choice of their few plants, and contrive, by attention to the main points of watering and shifting, to grow them healthy for many years, but whose collections are, of course, limited. No lady would be without her myrtle, and slips of this will root anywhere and anyhow. Then there are the old-fashioned geraniums—the oak-leaf, the peppermint, the horse-shoe, the ivy-leaf, and others prized for the scent of their foliage,—which strike instantly from slips; and, of course, anything that would root easily so, would be a very short time rooting from prepared cuttings. The old *Acacia armata*, another cottage favourite, and the fuchsia, when there were but two or three known,—and that a fuchsia was a fuchsia was all that any moderate amateur comprehended,—was quite a star. *Mesembryanthemums*, and two or three other succulents, formed a portion of the better and more extensive collections; but all these readily struck root, if a shoot was taken near the bottom, and this was the extent of the general knowledge on the subject of propagation. Such people never dreamed of the wholesale propagation that is going on at nurseries, nor did they think of using a knife to prepare the base of a cutting. If there were branches broken by the wind, they were stuck in a pot, and as the fracture was generally where the branch joined the old wood, it rooted much oftener than it failed; but all this, simple as it seemed, gave very little notion of cuttings. The most easily-rooted subjects are greatly hastened by applying proper means; and although many of them will strike in a common border, if properly prepared, they would root much sooner if covered with a hand-glass, and still more readily if hastened by a little bottom heat. One of the first objects is to get proper cuttings—that is to say, cuttings of wood, as it is called, in a proper state. Some things strike best with the wood in a young growing state; others require that the wood should have done its growth for the season, and become nearly ripe; some strike from the hard wood only; some will only root in sand, others in wet moss; but there are certain rules which apply to all, and, if not absolutely a necessary condition, tend to hasten the rooting of the most free strikers. Every morsel of some plants seems to bear the rudiments of roots: the gloxinia will strike and form plants from leaves only; the clippings of carnation leaves will often strike root as they lie on the surface of the soil, although we never knew one to

form a plant. Many succulents are so free to root, that when pieces have been accidentally left on the tan-bed, or carelessly left on the soil on a pot, they push roots from their sides or ends directly into the earth, and would, if left, soon become perfect plants; other things emit roots at their joints, without any other encouragement than the damp the atmosphere affords. The vine frequently does this, the balsam commonly; the verbena will trail along the ground, rooting at the base of every leaf, and a single elongated shoot may often be cut up into many plants. But there are other plants so obstinate, that they require all the skill of an experienced propagator, who could tell us of his many failures before he succeeded to his mind. It is, in fact, so important a branch of the profession, that scores of good gardeners would be totally incapable of undertaking a place; and "Wanted: a propagator" is as distinct from "Wanted: a gardener," at the head of an advertisement for a man in that capacity, as "Wanted: a bookkeeper." The first lessons in propagating by cuttings would be well given upon simple and freely-rooting plants. To increase such plants, let the operator be shown first that every leaf is at what is called a joint, and that as roots emanate from joints, the first step after the cuttings are off the plant is to cut the lower end clean up to the base of a leaf. Next, as the lower leaf would be inconvenient for setting in the soil, the leaf should be cut off; not that this is a necessary condition, except for the convenience, because many think the leaf would assist the rooting; and it is quite certain that, but for the inconvenience, it would be just as well on. The leaf however, is always in the way, especially if a number are to be placed in the same pot; the cutting of the lower leaves off, therefore, as high up as the stem is to be set in the soil, is a matter of course.

The next point to attend to is, to have the cutting made of the right length. One joint above the soil, and one below it, are sufficient in many things; a branch of geranium, for instance, may have half-a-dozen joints; these might be divided into three proper cuttings, each with its joint at the base under the soil, and one joint above the soil. Cuttings of subjects with closer leaves,—such as pinks, heaths, acacias, diosmos, and many others,—require several joints below, and the same above; and if the leaves were not, for a certain distance, to be taken off, such cuttings could never be properly

planted in the pot, so as to have the soil or sand close all the way up to the stem—and without this, cuttings cannot well root; the leaves would in some cases, prevent their being made firm, or by spreading out, would actually lift up the cuttings.

Among the most efficacious plans that we have adopted, we think the following practice has been successful in the greatest number of cases—that is to say, it has answered with the greatest number of plants; not that so much trouble or such nice management is absolutely required in a half or a quarter of the subjects, but while it is necessary, or at least efficacious, with a great number of plants, it certainly hastens the rooting of even the most common and free-rooting subjects.

No matter whether it be the epacris, acacia, heath, correa, camellia, gardenia, ixora, azalea,—in short, no matter whether stove, greenhouse, frame, or hardy subject, let a pot be filled one-third full of common drainage crocks, or nearly so: a bit of moss covering the drainage, though not absolutely necessary, prevents the soil from running down among it, and makes the water run freely through, without washing down the compost. On this put the soil, which should be half loam from rotted turves, and half sandy peat with the fibre in it, well mixed, and rubbed through a very coarse sieve; the pot should be filled within half an inch of the top, and then it should be struck on the table, so as to settle it down a little; but more should be put in, to make it at the finish level, and half an inch below the rim: this half inch is to be filled to the top, perfectly level with the edge of the pot, and then saturated with water, till it runs through the soil, and out at the bottom. Silver sand is the only proper material for this, and it should be perfectly clean. The pot is then fit for the reception of your cuttings, the size of it having been selected as appropriate as possible for the cuttings it is to receive.

Whatever be the nature of the cuttings, the preparation must be similar in many respects. First, consider that you want as little above the soil as will conveniently form the plant,—that is, ensure a growth. Generally speaking, two joints with the growing heart is sufficient in long-leaved subjects, such as dahlias, gardenias, ixoras, camellias, neriums, and such like; and for small-leaved subjects, such as heaths, half an inch above and half an inch below is sufficient. Let

the bottoms of these cuttings be taken off close under a joint or leaf, and with a sharp knife take off the leaves full half an inch high ; these cuttings should be sorted, so that each pot may be filled with but one family of plants, and, when you have enough, only one variety.

Next take a bell-glass that goes well inside the rim, and make a mark with it in the sand ; then, the sand being saturated with water, you may take the cuttings one by one and press into the sand to the bottom of it, so as just to press but not to enter the compost beneath it. When you have put all in that you intend, let the surface of the sand be watered with a fine rose, to settle it well about the stems, and cover with the glass, which must be gently pressed into the sand, so that it shuts out the external air. If the pot be now plunged into a tan-bed, or any other medium that yields a moderate bottom heat, and the whole be shaded from the sun, and if the glasses are removed in the morning, and the inside of the glass dried, many kinds of cuttings will be rooted in a few days. But water must be administered freely, and the glasses must not be kept off long together for the first few days, and the general warmth of the bed must not be allowed to decline. If any of the cuttings should damp off from any oversight in the preparation, let such as damp off or fail be at once removed, that the infection may not reach the others.

In this way some of the most delicate and difficult things to propagate by cuttings may be rooted with a tolerable degree of certainty ; but if we were propagating camellias in large quantities, we should not cover them with glasses, but put the pots with the cuttings, as thick as we could stick them in, under the glass of a common hot-bed, and take especial care that the soil in the pots did not get too dry. Very few of them would miss if they were cut properly, and as they began to grow we should give more air, until we could remove them to a cold frame, and soon after pot them off in small pots, one plant in each. The more hardy the plant, the less bottom heat should there be ; but it is certain that by keeping the roots warmer than the tops, the growth there is encouraged. Geraniums and many other plants will strike in a common border under a hand-glass, but the plan we have mentioned will generally succeed with the most delicate and the most obstinate of hard-wooded exotics, as well as with the ordinary free-growing plants. Rapid growing climbers of the perennial

or hard-wooded kinds will generally strike very freely with one joint under ground and one above; vines especially strike so easily without any other management than merely cutting them at a joint, that on one occasion we remember to have used the cuttings of a vine to mark the spots where we had sown annuals, and at the growing time found ourselves possessed of an immense quantity of healthy plants, which had we cared for them would have been of consequence, from their great number. The willow is just as free, for it was once a common practice in country cottage gardens, to get willow stakes, and bend them by sticking both ends into the ground, and although there was no pains even taken in cutting them at joints, both ends would root, and the growth at every joint formed a complete willow hedge; this was a very usual fence between two gardens. Currant and gooseberry bushes will strike by merely cutting the bottom up to the joint, and with six or eight-inch lengths, half being inserted in the ground, and half exposed, scarcely one in fifty would miss if the ground were kept moist. Roses of the smooth-barked kinds strike very freely; but in all these apparently simple processes there is some care required in the preparation of the cuttings. For instance, we must cut close up to the joint, so as just to reach the solid part, if it be anything with pith in the centre, but we must not go beyond it. If there be any of the hollow or spongy wood left on, or the joint itself is cut into, there is great danger of failure, for the roots emanate from the joint, and nowhere else, and by exposing that to immediate contact with the soil, and leaving no useless wood below it, the process is greatly aided. As to vines, roses, currants, gooseberries, camellias, geraniums, and indeed, most free-growing shrubs, trees, and plants, the whole length of the last year's wood may be cut into lengths, with a joint or more below and one above, and will do well, and in almost all cases the last year's shoot will strike with care, though with many more difficult subjects the cutting must be taken off at the heel as soon as it is long enough. The common cabbage, after the main head has been cut off, will send out shoots, and these, if taken off and planted as soon as there is stem enough to insert in the ground, and it has begun to form a heel, will strike, and form as good cabbages as the parents, but smaller; these, however, would be required to be taken off at the heel, and almost with a bit of the stump, but cer-

tainly the whole of the shoot ; we mention this rather to show the nature of plants than to recommend it as a practice.

The process of rooting is much longer in some plants than others, and the difficulty therefore consists in maintaining the shoot or cutting alive while it is going on, until it is able to support itself, and it is in the length of time a thing takes to root, that all the difficulty consists. In some cases the difficulty amounts almost to prohibition, and it is in these that we resort to layering, that by continuing just enough of the parent support to prevent the part from dying, we may give the intended new plant a year, or at least a season, to do its work in, whereas it would require the utmost ingenuity, skill, and attention, so to preserve the life of a cutting as to enable it to root. It is said of the mulberry-tree, that if a healthy branch be cut off at the heel, and be planted two or three feet in the ground, it will root, and become a tree ; and there are records of such being used for posts, or some other purpose, having become fine bearing trees ; but these are exceptions to the general rule, because we have tried this, as well as many other experiments, and have failed ; though we have not the least reason to doubt that where the soil has been congenial, the wood healthy, and circumstances of moisture, station, and perhaps climate favourable, these large branches or limbs have been known to strike root, and to flourish afterwards. We do not recommend the experiment, because we think it may cause a loss of time if depended on for a tree, and if not depended on, it may as well be let alone. We certainly have known a limb of the mulberry that was lying on the ground grow all along the upper surface, and when removed, it was found to have struck root in many places on the under side. It appears to us as a general principle, that the rooting of cuttings is invariably promoted by the soil they are in being of a higher temperature than the air above ; hence, autumn is always the best time to insert out-of-door cuttings,—the earth has had all the warmth of summer, and is of a higher temperature than the atmosphere in general. The same cuttings that do well in autumn will not do so well in spring, for then the earth has the chill of winter in it, and the general atmosphere is for a long time warmer than the soil. The cuttings first form a sort of callus, which is like a spongy swelling at the base, and they take nourishment from this before the spongioles or fibres appear. It is

this first process that is hastened by autumnal insertion, while the plant above is totally at rest, and when the upper portion is excited, the roots grow as fast as the spring buds and leaves require their aid. When cuttings of hard-wooded plants are apparently at rest above the soil, we may frequently observe in the slowly rooting kinds, that the bottom has swelled into a lump; a sure sign that it is doing well, although it may even then take months to root: indeed, the cuttings will frequently grow with only this callus to support them for a time, and if they are neglected at this critical period, they will assuredly perish.

As soon as cuttings, which are generally put too close together in pots to grow long in health, are fairly rooted, they should be carefully potted into single pots, and treated until they are established in their new abode with more than ordinary care; they should not be exposed to the air or sun at first, and above all things, they should be well supplied with moisture. Out of door subjects, and especially of the deciduous kind, should be treated as the parent plants are. They must not, for instance, be removed until the leaves fall, and they may then be planted out at larger distances, to grow into strength, or be placed where they are to remain. China roses—with which we class, by the way, all the smooth-barked kinds, for they all strike freely—may, towards the autumn, be put very thickly into a pot or pan, and plunged in an old hot-bed without covering except from actual frost; or they may be inserted very close together in beds in the open ground, and have no other care than being covered with litter in very severe weather, and they will for the most part succeed—presuming that the rule for cutting up carefully to a joint, but not into it, and having one joint above the soil, has been attended to. No matter how long a shoot may be, every two joints will make a good cutting. These, when rooted, must be planted out with plenty of room to grow; but they must be well rooted and growing before they are moved. If this has been delayed till the spring, they must have a little gentle bottom heat to excite early rooting; because the plant is in a more active state, and would grow and exhaust the sap within it, before the base became callused and produced any supply. The growth, therefore, should be checked above and excited below, that the process may be hastened. In roses, however, as in many

or most other deciduous and half-deciduous subjects, the plant soon roots so completely that there is no waste or exhaustion of the sap, and there is time given for the formation, first of the callus, and secondly of the roots. We have tried a hand-glass full of rose-cuttings of various kinds stuck into the soil in the open garden in November, and we have tried a like number of the same kinds similarly treated in February; we took all the necessary pains to give proper moisture in both instances; in April our spring cuttings were all growing fast, and the autumn ones had not stirred. Some of our friends, seeing them at this time, tried hard to persuade us that we had mistaken the seasons and reversed them. Another month, and the buds of the autumn glass-full began to grow, and the shoots of the spring ones had died. This explained in itself the cause of failure; the spring shoots exhausted the cuttings before they could move at the bottom, and though they lived awhile upon the sap within them, they lived, as a nosegay lives in water, simply on their own means, which water prevents from drying up, as the moist earth did that of the cuttings; but the growth exhausted it. The cuttings of every succulent subject, such as the green wood of the geranium, many of the cactus, euphorbia, and cereus families, and all juicy plants in general, are the better for drying a day before they are inserted. The gloxinia and achimenes, the gesnera, and some others, are capable of propagation in a singular manner; the cuttings of these are merely a leaf with a bit of its foot-stalk; there is no joint required. Every part of the plant appears vital; but they require bottom heat. The *Hoya carnososa*, a hard fleshy-leaved plant, very common in greenhouses, is equally curious; a leaf is the cutting, and we have known the bits of leaves, after the training and trimming of a plant, carelessly left in the pot, to be all struck into the soil; but these are all exceptions to the thousands of plants that require for healthy propagation a joint for the base and a joint above the soil for the growth.

Much discussion was raised some time since, in the periodicals, about the possibility of general propagation by leaves. It was assumed, that the *Camellia japonica* and the orange tribe had been so propagated; and, therefore, the only thing to learn was how to accomplish it. We dissent, however, from admitting the propriety of these speculative operations;

unless changes can be rendered profitable or advantageous, they are of little value. Every leaf of the orange and camellia covers a bud, and we know we can form a plant of a bud and a leaf. Leaves are only used as the means of propagation in such plants as are of a different structure, and which afford no readier means. Upon the whole, then, we may conclude, that there are several conditions which apply generally to the propagation of plants by cuttings :—

First.—The more tender the fibres and the more delicate the plant, the more light and free must be the soil to strike them in.

Second.—Hence, silver sand is one of the best mediums with which to surround the stem, and exclude the atmosphere from the base.

Third.—But as there is no sustenance to be derived from sand, there should be a proper soil into which a cutting can immediately send its roots in search of the food it requires.

Fourth.—That the base should in every case be excited more than the portion above the soil.

Fifth.—Therefore, bottom heat in a moderate or a large degree, according to the temperature above, should be supplied.

Sixth.—That where cuttings have leaves, as in evergreens, evaporation tends to exhaust the sap, and should be prevented as much as possible.

Seventh.—Therefore, hand or bell glasses are necessary to cover all such cuttings as are taken from growing or evergreen plants.

Eighth.—And, as the sun would greatly accelerate evaporation, cuttings should invariably be shaded.

Ninth.—That as deciduous plants have a period of rest, and that is of some months' duration, the fall of the leaf, which indicates the commencement of this rest, is the proper time to take cuttings.

Tenth.—And that, besides, the autumn finds the ground in the best state to give the advantage of a higher temperature for its base than the top experiences, and this condition preponderates through the whole winter months, so that the base of the cutting is prepared to support the spring buds as soon as the genial weather excites to growth.

Of course, we have presumed that the cuttings have been prepared with proper care as directed ; and though we have stated the conditions required by the most delicate, the more

robust will root in common soil, and succeed with much rougher treatment.

EYES OR BUDS.—This is perhaps the most rapid of all propagation, so far as the mere number of plants produced is concerned; because, though it only applies to plants to be grown on their own roots, such plants are more valued than worked ones. The raiser of a new vine, we will suppose, has a dozen feet of good ripe wood, and is anxious to make the most of it. Nobody would thank him for a budded plant; that is, a plant with his new one worked on it. If he cuts up his wood to make ordinary cuttings, every cutting must have two eyes or joints; but if he propagates by eyes, he makes a plant of every one, thus doubling his number. The raising of plants, therefore, from eyes is a nice and important operation. What applies to a vine will apply to many other plants. The datura, now called *Brugmansia*, sheds its leaves, and the wood is soft, spongy, and a good deal of it green; this plant is especially propagated by eyes. Many other plants of a pithy nature—the large kinds of fuchsia, such as *fulgens*, and even larger, can be grown from eyes; and if we really desire it, we believe the camellia, the orange, and many other plants could be as easily multiplied that way as any. But all hard-wooded valuable plants, like the camellia and orange, can be propagated most rapidly by budding; in which case, every bud, being put on a strong and vigorous growing stock, can be grown into a head before it would on its own bottom be six inches high. In preparing the buds of vines for propagation, cut half an inch of wood above the eye and half an inch below it. “Let the wood be cut in the autumn, and the cuttings be kept with one end in the ground,” say our forefathers, “until the spring, when the eyes are to be cut with a portion of wood to them.” One author says, “Cut three inches of wood below the eye and a quarter of an inch above it;” another says, “Cut as much wood above as below:” and a third says, “Cut close up to the eye below and three inches above.” The latter is safe, and if such were placed in the open ground as soon as the wood is thoroughly ripe, and planted two inches below, they would come up, and root well at the same time. But the ordinary way of propagating is, to cut the eye with about half an inch of wood above and below it; get a quantity of pots of the size forty-eight, with good rich soil, half loam from rotted turves, one-fourth cow-

dung, and one-fourth good sandy peat soil, well mixed. Put a third of the pot full of drainage and fill with the soil, thrust the eye down in the centre with the wood downwards, and the bud of course upwards. Let the pots be levelled at top, and they may be set aside, while you prepare, about Christmas, a good hot-bed, and when the heat is pretty even and regular, put the whole of the pots in and cover partially, leaving plenty of air. The pots should be sunk about half-way, so that the soil will be warmer than the atmosphere; and this difference may be kept up by allowing the heat to escape from time to time sufficiently, but not to cool the bed. As the heat of the bed declines, thrust the pots down lower. These eyes will start into growth, when they must be refreshed with moisture at the same temperature as the bed. When these have made a growth of a few inches, turn out one of the pots and see if it is filled with roots; at which time they must be shifted to pots a size larger, say size thirty-two, and be removed to the stove, where they may be trained up the back wall, or they may be turned out in a south border in June, and there allowed to grow, with some means of support to prevent the wind from damaging them; and at one year old these vines will be strong enough to send out or to plant wherever they are to remain and fruit. Instead of the hot-bed they may be plunged into a tan-pit in the stove, and there made the best of until turning-out time; but, if quantity of wood be desirable, they ought to be allowed to complete their growth in the stove, and not to be turned out at all. To grow from eyes in the open air, it is the best way to cut the wood close up to the bottom of the eye, and leave three inches of wood above it; this is thrust into the ground so as to leave an inch above the surface; but the time to insert these is November. In the spring many if not all will come up and grow into good strength the first year. Many prefer the vine raised from eyes, and if this be the case, the largest and most plump buds should be selected on the last year's wood; and a pretty general notion prevails that the nearer the eye has been taken from the lowest part of the branch, the better will be the plant. There is nothing in experience to justify this, but the shorter the joints in the last year's wood, the better; therefore, when there is a choice, select a branch of well-ripened short-jointed wood for the purpose, and only use the full sized eyes. The other plants to be raised from eyes are

to be treated in a similar way for the most part ; but we have had occasion to propagate the dahlia rapidly, and on receiving the plants from the nursery, we found three pairs of leaves and the top to spare above the two lower ones, and we determined on trying the eye system. The leaves of the dahlia being opposite each other, we began by cutting off the top as close to the joint as possible, and prepared that for striking, by taking off the two bottom leaves ; we then took off the next cutting close at the under part of the joint and split it into two, each having a leaf with its bud or eye at the base and the split part of the stem. We treated the next two pairs of leaves the same, and left the stump of the dahlia with only two leaves. We then prepared a pot as for cuttings, with soil up to half an inch and sand the rest ; and we put the eyes in close to the pot, just reaching down to the soil, and with the leaf inwards, and the split stem upright close to the side. These were put into a fresh hot-bed with other dahlias, and, like them, kept warm and moist. Every eye grew well, the top ones—that is, the two that were smallest—being the weakest ; but they were rooted and potted off in four weeks ; and we have adopted this plan ever since when we had any great desire to propagate and make the most of a plant. We have raised the scarlet geranium, the fuchsia, and many other plants in a similar way from single eyes with a little bit of the last year's wood ; but we thought more of the dahlia than anything else, because it is very juicy, and was therefore very likely to fog off ; this, however, it will not do if the cutting close up to the joint be attended to, and the heat well kept up—one of the most essential things in the striking of the dahlia, and in all other subjects where the cuttings are more than usually juicy and green. The *Euphorbia jacquiniflora* will come from eyes, which sometimes make better plants than those from cuttings. The *datura* or *Brugmansia arborea* will from an eye grow to a six-foot plant in a single season, and flower profusely. *B. lutea* and *B. sanguinea* will do well, but not grow half the height the first year.

HYBRIDIZING.

Nobody seems astonished at the immense improvement that has been made in the breed of cattle by the crossing of different races. Scarcely anything in its natural state is without

some important blemish. One race of animals is strong, bony, and long-legged ; another is plump, small-boned, weakly, and of diminutive stature ; a third is light, active, carries no flesh, and of delicate constitution ; and more *ad infinitum*, have peculiar characteristics. There is the strength of one, the beauty of another, the strong constitution of a third ; and some desirable property may be found in each and all. The judicious mixing of these qualities has produced the splendid races of animals which this country breeds. In horses, sheep, cattle, dogs, poultry, and even rabbits, the most extraordinary improvements have been made, but it excites no wonder. We see them, admire them ; we hear that this is one breed, and that is another, and there our admiration is at its height, without moving our curiosity or wonder. Few, however, think what very similar means are used to produce improvement in flowers and plants ; few know that there are various races of vegetables with just such differences ; that branches, as it were, of the same families have their peculiarities, some very desirable, others the reverse, and that by crossing the breeds of these different subjects, we effect improvements that are most important. We are not going into the discussion of whether or not the term "hybridizing" is properly descriptive of the process by which plants are improved, because it would be out of place here. The word is commonly used to express a mixing of the breed of plants ; but strictly speaking, it should be applied only to that kind of cross which, like the horse and the ass, produce a mule,—where in fact the breed stops, nature permitting no further deviation. It is well known that the mule, which is a complete cross between the fleetest and the most enduring of animals, is a most valuable beast. But hybridizing is accepted too generally in flowers and plants, and is applied to the mere crossing of two plants of the same family, as a scarlet and a white azalea or geranium, or other plant, differing perhaps in colour or habit. For our own part, we have always regarded the easy crossing of two differently habited plants, and the produce of which in turn bore seed, as a proof that they were of the same family ; and there is no stronger proof that those who classed the rhododendron and azalea together, were right, than the fact that a plant like neither, and yet bordering on both, is produced, and it seeds as freely as the parents. However, we accept for the present the word hybridizing to mean the crossing of races, whether

of the same family or not, and proceed to notice the benefits arising from such process. Perhaps the greatest advantage that has been experienced has been in those instances where a hardy plant of little or no beauty has been crossed with a tender one of great brilliance, and the produce has shown great increase of beauty on a hardy race. Let us look at once to a very familiar cross. The Nepal mountains produce rhododendrons with exceedingly brilliant crimson-scarlet flowers; the American rhododendrons are very hardy, and have white or dirty purple flowers, or various shades of lilac, violet, or puce. The *R. ponticum* is a very poor flower; the *R. catawbiense* has many shades, from nearly white to deep purple; the *R. maximum* is white or dingy purple. Now, the effect of crossing these with the brilliant varieties from the East, has been the produce of hardy varieties with greatly improved colours, such as the *alta-clerense*, whose bloom is a brilliant crimson. Here, then, we have a decided advantage, enriching our shrubberies with new varieties, and really adding great interest to the cultivation of that family. Mr. Burns, of Tottenham Park, has raised many very beautiful varieties called hybrids, on account of their being the produce of similar crosses. Mr. Smith, of Norbiton, Surrey, has been equally successful in crossing rhododendrons with the yellow azaleas, and has thereby produced yellow rhododendrons, and, in fact, every shade from yellow into bronze of various hues; and at this moment there is going on a series of experiments in crossing this flower that must result in the production of many extraordinary novelties. Crossing different races and varieties has produced many of our most valuable kinds of vegetable, especially in brocolies, some of which are nearly as fine as cauliflowers, and perfectly hardy,—that is, will stand all ordinary English winters. In plants, the novelties produced by crossing are almost endless, though many of the most striking varieties have been produced by accidental inoculation, and not by any organized system. In correas, the well-known species (so called) in common cultivation were *speciosa*, *pulchella*, *alba*, *viridis*, and *rufa*; but Mr. Milner of Clapham crossed these with one another in various ways, and the result was all the new varieties let out within the last twenty years: *Milnerii*, first, then *Cavendishii*, *longiflora*, *rosea*, *bicolor*, *grandiflora*, by Low, Groom, Pince, Gaines, and others, partaking of the qualities of the various species in all

manner of combinations. Then we have a large family of the fuchsias, of which very few were known until the importation of *Fuchsia fulgens*, which was at first doubted, but proved to be a fuchsia by the readiness with which it crossed the old varieties, and produced modifications, as varied as could be wished. It was by crossing two species of *calceolaria* that Mr. Green obtained his enormous flowers on the herbaceous kind of plants, and seeding again from these varieties, crossed as Nature crosses them, is annually introducing still greater removes from the originals, until the difference in colour, habit, form of flower and foliage, to be found in every batch of seedlings, is giving rise to an endless catalogue of arbitrary names with which these numerous varieties are dignified. It is the first remove that deserves the credit; the seed saved afterwards continues to produce novelties, and such as are worth naming and propagating are advertised and sold out from year to year; we wish we could not add, "and a good many that are worthless." We might go through many families, in all of which changes have been made by a mixture of breeds, in the greater part of which, however, Nature has been her own director, although people have taken credit for artificial fertilization. Time after time we have been favoured with several supposed species, as in the dahlia, for instance, when the white, the dirty yellow, and the purple, were honoured with such distinction because of some trumpery difference which ordinary observers could not see, except the colour of the bloom, which we have had reason to know is not constant. A new colour imported from abroad was a botanical wonder, a new species. Now, had these species been really well named,—that is, had they been really species,—there might have been some credit in hybridizing, as it is called, and the thousand of varieties we have produced had been creditable hybrids; but the fact is, that Nature has her seedling varieties as well as her species, and it is time we imported things by their proper classification, and avoid giving merely seedling varieties the dignity of distinct species. The English florists, however, very soon settle the fate of so-called species, and knock about botanical distinctions very sadly. The *Fuchsia fulgens* was like a species; it differed so much in foliage, habit, and flower, that there were those who doubted its being a fuchsia at all. This was soon settled by our indefatigable raisers of new varieties—some of whom take un-

common pains in crossing two plants of a different nature, to produce a race between them ; while others content themselves with placing the plants together, and leaving Nature, and her little assistants—bees, flies, and other insects—to convey the pollen of the one to the pistil of the other ; and each will in many cases be successful. The fuchsia mixed directly ; every conceivable variety of form, from the two or three inch tube fulgens and its varieties, to the smallest of our diminutive kinds, has been produced, and the fuchsia now presents us with a dozen, or perhaps rather more, beautiful varieties, which would be enhanced in value by the entire destruction of the thousands which differ so little from one another as to become mere weeds.

But let it be borne in mind that the real object of this artificial impregnation, so generally called hybridizing, is to produce something between two extremes, and that this is the more profitably employed among the useful fruits and vegetables. If, for instance, we could procure a Russian cauliflower that would stand all weathers, but a coarse one, and perhaps too strong for English palates, it would be an object worthy of our labour to cross the hardy coarse sort with our more delicately flavoured, tender, and handsome varieties : the chances are that we might be rewarded with a hardy race of good vegetables, and various grades between, because so far as hardiness is concerned, the parent, or seed-bearing plant, takes the lead. We might, in such a case, find nineteen out of twenty as coarse as the kind the seed was saved from, and the improvement but small and confined to few ; but as all such work requires time, the improvement, however small, must be regarded, and the work persevered in another season. The best of the plants, though only a little better, must be seeded from, or impregnated again with the best cauliflower, and the produce tried again. This is the way to benefit by what is called hybridizing. Very few persons trouble themselves to raise grape vines, but if there was a determination to obtain new kinds of grapes, the best way would be to grow in pots such kinds as would, if mixed well in any proportion, make new and better kinds, partaking of the best qualities of two. For instance, the muscat of Alexandria is large and delicious ; its only drawbacks are its lateness and its colour ; the black Hamburgh is a splendid colour, but, beyond sweetness, it has little to recommend it ;

by growing these in pots, so that each might be retarded or advanced by the heat to which it is subjected, both might be brought into bloom at the same time, and if crossed, the result might be a black grape with the muscat size and flavour, or some approach to it; for a better chance of success might be added half a dozen of the best grapes. The sweet-water, which is early, might by pot-culture, be made to increase the chances by showing its bloom with the others; it is quite certain that if the grapes were all planted in one house they would not all bloom at one time, and that to accomplish this the sweetwater must be necessarily kept back in the open air, while the black Hamburgh may be pushed on a little, and some late ones actually forced; for unless they are all flowering together, they cannot fertilize each other. It would give a fairer chance of a good variety to let all be put into one house when in bloom, than it would, perhaps, to actually fertilize one with another artificially.

If a grape* could be obtained with the colour of the Hamburgh, the earliness of the sweetwater, and the flavour of the muscat, it would be beyond all price valuable. There is no doubt that the raisers of stocks for grafting pick up their seeds anywhere, and, therefore, raise nothing but common wild fruit-trees, which are the result of ninety-nine stones and pips out of a hundred; but if, like the late Mr. Knight, people would fertilize one sort with another, of such qualities as may, when amalgamated, be an improvement, much better chances of success would be given. If, among a large quantity of stocks come up from pips and stones, we could, by carefully going over them, find any strange foliage or habit,—anything, in fact, that looked different from a wild stock,—our business would be to mark such, not to be used for stocks, but to stand and fruit, and show what they were; for the chances are, that, as the habit is different, the fruit will be different; and it is only by such means that new varieties have been from time to time produced; and no man can guess what splendid varieties of plums, apples, pears, and cherries, may be buried, as it were, in stocks: for many have treated tens of thousands of seedling-plants as if they were all wild, without once taking the trouble to examine the foliage, to see if there were any that had wandered from the ordinary

* Since this was written in 1850, the muscat Hamburgh has been produced, and a valuable grape it is.

course. It may not be known to every one, that if the pips and stones of the finest fruit be sown, the great bulk of the produce will have run back to the wild state ; and acres have been sown and planted for nothing but to work as stocks with the good fruits ; but as every good variety we possess must have been raised from seed, it is impossible to form an idea of the new and good varieties that might have been among the stocks doomed to support other known kinds. This is the fault we have to find with everybody who raises anything from seed ; they do not examine their crops at different times, to see if there be anything new among them. In a field of peas, there may be some a week sooner in bloom,—a most desirable quality ; some immense bearers,—another desirable point ; others last longer green, and in yielding condition,—an advantage by no means unimportant ; however, they are all usually served alike—all condemned to the sack and the market.

It is to be kept in mind, that some of our very best improvements in fruit, flowers, plants, and vegetables, have been accidental ; that is, there was no merit belonging to the raiser, who has sown seed as other people sowed it, and has discovered among the produce a something new, and has made the best of it. But how much the chances of obtaining these things might be increased by proper means ! We may, without difficulty, attribute all these changes to the crosses of breeds ; and it is no bad study to consider, first, the good and bad qualities of plants, flowers, vegetables, and fruits ; and in the second place, to promote those crosses which are likely to improve the new varieties. If, for instance, we have a gold-pippin apple, which is, for a small apple, almost faultless, and a ribstone-pippin, which is a fine large apple, equally faultless, the natural conclusion is, that if we could effect a cross between these two, we might obtain new ones, unlike either, but partaking of both, and combining two exquisite flavours in a middle-sized apple, or get the flavour of the ribstone in a small table-apple, or the flavour of the golden-pippin with a larger-sized, but equally handsome fruit. Again ; if we have an apple of delicious flavour, and handsome appearance, like the nonsuch, which will not keep, and a fine keeping apple, like the russet, or the French crab, a cross here might produce a handsome and high-flavoured apple, that would keep. In short, we might obtain the good but opposite qualities of any

two fruits combined in one; and this is the object of all gardeners who profess to raise new varieties. There are two ways of attempting this; the one by direct artificial impregnation; the other by planting, or bringing plants so close together, that, when in bloom they will impregnate each other. Nature will do then, what the gardener must do artificially; but by directing the reader how to perform this, we may open a field for his ingenuity to work in, and provide at least a never-failing fund of amusement and gratification from the culture of a few choice plants.

DIRECTIONS FOR HYBRIDIZING.—In artificial crossing, the sorts to be crossed must be in perfection of bloom at the same period. The pistil of the one must be ready to receive the pollen or farina of the other, just as the pollen or farina is ready to perform its work. The pistil and farina are, in most plants, provided in the same flower, the pistil leading to, or forming part of the seed-vessel, and the farina being provided in the anthers, which, when ripe, burst and show the farina in coloured dust, which, if left to itself, will attach itself to its own pistil, and actually grow there; for each grain of dust that performs its office strikes down a thread so fine as to be imperceptible, even if it could be exposed; and this thread actually reaches the seed, which thereby receives its vitality. Now the cross impregnation, by artificial means, is, to take away the anthers, which contain the pollen, from the flower to be impregnated, to prevent its performing that office itself, and to take from the flower of the sort we wish to cross with, the anthers with the pollen, the instant it bursts, and to apply it to the pistil of the flower we have prepared to receive it. If this be properly done, when both parts are in a proper state, there is no doubt of the result.

In nature, we find insects of all kinds are busy in performing this office. Bees may be seen, with the pollen which they have been revelling among hanging to their limbs, and almost covering their bodies, leaving particles of it on every flower they visit. When plants and trees of one kind only are together, it is only the same variety that is produced generally, because, whether the pollen which is left on the pistil is from its own flower or a neighbouring blossom, the result is the same; but if two or more kinds are close to each other, it is as likely to be a cross as otherwise; and this is what we should call a natural cross, because no artificial means

are employed. The visits of flies and other insects to many different flowers in a day, occasion very many crosses that a man could not even think of. But we are naturally impatient, and therefore use the means which are at hand, by performing the work ourselves, whenever we have a distinct object in view. Let us suppose that our object is to obtain a yellow moss-rose. The most natural conclusion we should come to would be this: that the parent, or seed-bearing plant should be a moss-rose that is not too double; and that we should procure all the yellow roses that yield pollen, and with these impregnate the moss—some with the yellow briers, some with the yellow China, or tea kinds,—in fact, some with every yellow rose we could render subservient to our purpose, and so multiply our chances of success. Impregnate all these yellows with the pollen of the moss. If this were well done, the chances would be in favour of producing something very new, one way or the other. But there would be every probability of the moss-rose seeds producing more mosses than the seed of the yellow kinds, because the parent will produce mostly plants of its own habit; and that the chinas, briers, and other yellow roses, would produce similar families to their own, but various modifications of the moss colours. The blooms are not so numerous on the rose but that we might carry on this artificial impregnation easily; but if we desired to fertilize anything on which flowers were very numerous, as the cauliflower or brocoli, our plan would be to grow the plants that we desired to cross close together, and leave the work of impregnation to the bees, flies, and other insects, and to the wind, which is a mighty agent in these operations.

In lilies, amaryllis, tulips, and many other subjects where the flowers are of a manageable size, artificial impregnation has been carried on to a considerable extent; and we have now a very extensive collection of very beautiful hybrids—so called—but which bear seed, and therefore are not such crosses as in animals are called hybrid. However, in flowers and plants, the result of a cross between two of the same family is so called, and we are to be understood as meaning such, when we use the term. It is only when these hybrids become so varied and so numerous as to be known as seedling varieties, that the term is dropped.

Just now florists are anxious to obtain a fine race of yellow picotees, although none but white-grounds are esteemed at

present. Those, however, who see that we have bright yellow grounds to very rough and bad flowers, are crossing them with the finest of the white-ground flowers, to see if they cannot impart to them the fine forms and distinct markings which we possess in whites.

We might pursue this subject to any length, because there is scarcely a fruit, flower, plant, or vegetable, that has not some fault, very few in cultivation that have not some excellent quality. But there are certain rules that should always guide us in our attempts at improvement :—

Firstly, we should bear in mind that the plant we save the seed from should be that which has the best habit ; for that will be the prevailing habit of all the seedlings.

Secondly, that if they are plants not usually in bloom together, one or both must be grown in pots, so that one may be retarded, or the other advanced, or forced, as it were, to bring both in flower together.

Thirdly, that the pistil is only a short time in a proper state to receive the pollen ; and that is, when there is a moisture on the top ; but,

Fourthly, that the pollen will keep a short time, if gathered and kept from the air ; and, therefore, should be taken when it is ready, and saved till the pistil of the other plant is ready to receive it.

Lastly, that all flowers impregnated should have a piece of matting tied round them ; and, if you think it worth while, and are not likely to remember it, a small label, with a memorandum of what it is fertilized with, and when it was done.

In sowing the seeds, or pips, or stones, of plants which have been crossed, take all fair means of hastening the result. In fruit-trees, look at the foliage, and if there be any that have no trace of the wild stock, it is fair to conclude you have something worth trying. Therefore, as soon as the wood is in a fit state, work a piece on a strong three or four-year old stock, which will greatly hasten fruiting. Among roses, if you see any of the plants likely, from their appearance, to differ much from the parent, or otherwise look promising, bud it the instant you can, upon a strong brier, for that will perhaps produce a flower a whole season before the plant on its own bottom ; and, in fact, take every advantage to hasten the blooming, that you may be the sooner in a position to multiply it, if good, or throw it away, if good for nothing.

When you see the result, be not tempted to adopt it, unless it is a strikingly good thing. Let no mediocre claims tempt you to add one to the thousands of middling things already in cultivation. Better to count the time lost altogether, and begin again, than to be the avowed raiser of any unworthy novelty. We have a thousand more varieties of roses in cultivation than are worth the trouble. Pansies, fuchsias, calceolarias, cinerarias, verbenas, apples, pears, plums, and other things, have been multiplied until there wants a general sweep out; and it is bad taste to add anything to our garden-catalogue that is of secondary quality. If it be not entirely novel and good, or a complete advance over anything in the same way, have nothing to do with it. Better raise one good thing a-year, than twenty middling ones; for named flowers multiply, until people are deterred from selecting by the number they have to select from; and the fruit-catalogues perplex every man who wishes to plant, by the vast numbers of varieties, all said to be good, but three-fourths of which are inferior, and not worth growing in a small garden. Were it not that select lists are from time to time published for the guidance of amateurs, the task of selection would be hopeless.

ACCLIMATING—AN ERROR.

Much has been written on the subject of acclimating plants. Many great names have been associated with papers on the mode of accomplishing so desirable an object; and how far have we improved the constitution of any one plant, flower, or vegetable? Is the original potato more hardy than it was the day it was imported? Will the dahlia, though it has been obtained from seed year after year for half a century, or near it, stand a single degree of frost? We confess our faith in the possibility of obtaining from seed a hardier race of anything than we now possess. We believe we may say, that we have found some trifling difference in the capacity of some varieties to bear rough usage and some exposure; but this is not acclimating, this is improving the breed, a very different thing from acclimating. Those who advocate the possibility of changing the constitution of a tender plant make a great mistake. They give us instructions how to do certain things in a certain way, and say that this, or that, or the other

tender plant so treated will stand our climate ; but, independently of their failing the first trying winter, of which they never inform us, they never in their instructions tell us any one thing that changes the plant. They tell us, first, to drain the ground, for that naturally warms it ; next, to use certain compost naturally warmer in itself than the common ground of a damp cold site. Then it must be in a particular situation, sheltered from the north and east winds, and when we have done all this, we are to insert our plant. This is all very well, but what have they done in *all this*? Why, they have prepared a warmer situation, and more genial treatment, to prevent the plant from feeling the usual climate ; they can no more change the nature of the plant itself than they can change the leopard's spots. They tell us there was a time when the *Aucuba japonica* was a stove plant, then a greenhouse plant, and now a hardy plant, that is,—that it has been acclimated ; but there is a grand mistake in this. The *Aucuba japonica* never was a stove plant ; it was always as hardy as it is in the present day. It was totally unknown as to constitution ; it was ignorantly placed in a stove ; some gardener, more fond of experiment, found it was not tender, and tried the greenhouse ; there it did better ; and some other, or, perhaps, the same, then tried it out of doors, and found it flourished better still, and that it stood a very hard frost ; but whoever did this, took the credit of a discovery, that of having changed the constitution of the plant. Then, again, some of the writers on the subject generally tell us that the myrtle has been acclimated in the Isle of Wight, on the Hampshire coast, and in Devonshire, because it may be seen growing on the fronts of houses, and on walls, as freely as we grow the common jasmine or the China rose ; but the mistake here is, that the climate in these places is not so trying to the plants as the climate inland. The situation is warmer in the winter months ; the changes are not so great : it is not that the plants are a jot more hardy than they were when imported. Acclimating plants, therefore, is a palpable fallacy ; and we are half inclined to be angry with men professing to be gardeners, who write such nonsense. But changes are inimical to plants. If there were no frost at all, and a plant were removed from the stove at 80° of heat, to the open air at 35°, it would greatly suffer. The British oak, sown in the stove, brought up in the stove, and at one year old brought into the

open air in a frost of only one degree, would suffer exceedingly, if it were not killed outright; so that, if any one possesses a plant usually in a stove, and has reason to think it hardy, it ought not to be brought out at once; but it should be first removed to the greenhouse, and if it did well there for a reasonable time, it might in the summer be turned out into the open air, and it would be let down by degrees to the ordinary climate, and the winter would fairly decide its fate; whereas, if brought at once from 80° to 36° , not to say frost, it would, like our hardy British oak, suffer, if not die, though really a hardy subject. Again, there are some rhododendrons said to be hardy; but how should they be treated? If we buy the *R. campanulatum* in a pot, and keep it in a greenhouse it will make new wood, and set off in growth long before it would move in the open air. Let it be turned out in March for experiment, and if there were a smart frost, every young shoot would be killed, and then, forsooth, it would be set down as tender; but turn it out in the autumn, when at rest, and then it would not move until it was capable of bearing the seasonable weather: not but that the effects of a mild winter and spring might be a premature growth, and that it might suffer from the April and May frosts, which are often fatal to our fruit-trees. How many times have we known the walnut-tree, of the hardiness of which no one doubts, lose all its first shoots and the crop by a late frost? yet it would not on that account be set down as tender; but if the winter were to be ever so severe, and last long beyond its usual period, without any change from hard frost until it broke up altogether, the walnut would be safe, and that simply because it had not been excited into premature growth.

In our remarks on the protection of subjects out of doors, we have shown how fatal sudden changes are to many plants; and, moreover, we have suggested the best means of preventing mischief by keeping off the sun from frozen plants; for bad as is the change from warmth to frost, it is not so fatal as from frost to heat, a sudden thaw being far more fatal than a sudden frost. All we can admit, therefore, in the way of acclimating, is this: it is possible to change the climate of a place to suit a plant, but it is impossible to change the constitution of a plant to suit a place; and all the instructions, even from Sir Joseph Paxton, who is upon some matters

regarded as an authority, tend to that one point. A spot sheltered from the north and east winds, is recommended; this must be warmer than an open space where a plant would be exposed to them. High and dry ground is also recommended; this must be warmer than cold and damp. Then, again, complete draining is enjoined;—all tending to give warmth. And, lastly, a light compost, with good heart, but not highly manured—everything calculated to make a warm snug berth for a plant. The proper caution on all occasions is to avoid sudden changes, and therefore to inure the plant by degrees to its altered situation; and there ends the art and mystery of acclimation, which means changing the nature of the plant to suit the climate, but which in practice, according to their own showing, is finding and making a climate to suit the plant.

Let us follow up these remarks on the attempt to do impossible things, by a few observations on what is possible.

If we take a hint from the chapter on hybridizing, we may contemplate the possibility of obtaining hardy varieties of very tender families. Whatever we set our minds to do in the way of improving plants, or flowers, or vegetables, our progress may be slow, but with assiduity and perseverance we may be successful.

We long ago set out for the florists of England what appeared at the time some very hard tasks: we required them to produce the heartsease *round*; the cineraria *round*; the phlox *round*; the dahlia *two-thirds of a ball*; and many other equally difficult things: and some that appeared to them, but not to us, impossible, have been nearly accomplished—some, we might say, quite. Suppose we were now to say the cultivators of plants and vegetables must produce them hardy! We will begin with the pea. Let all growers of peas which are seedling plants, sow at many seasons, and especially sow all the kinds they can in autumn; let them take no pains whatever to protect them, but sow six inches apart, and only one in a place or hole; watch every frost, and examine, after a thaw, the effect of it. If they see one pea or plant stand better than another, prize it; and from that plant, and any others that stand equally well, save the entire seed. The next year, sow the produce in the same way; and, as nature differs a little in seedlings, watch every frost, and do the same again. If a man were bent on this, he might—we

do not say he would—but he might in a few generations obtain a hardier sort of pea.

Let us look at brocoli. Many sorts stand ordinary winters, and in poor soil nearly every sort will ; but we once went over a piece of brocoli after a frost that had killed and rotted acres, and observed two or three plants that seemed almost unaffected. We advised the gardener to save the seed from these, as they were evidently more hardy than all the rest ; but he would not promise, for vegetables were so scarce, that he feared he should be obliged to send them to table. Whether he did or not, we never heard ; but if he did not, a valuable acquisition to this class of vegetable was lost ; for it is by taking advantage of these sports of nature that we obtain new varieties ; and those who set themselves to work in good earnest for anything, must be on the look-out for whatever is new, and particularly if an advance upon the road we wish to go. Nature will do for us what we cannot do for ourselves, but we must be always ready to profit by it ; but, in the way of procuring hardy races of plants, we can only succeed by taking advantage of the smallest difference, and saving carefully the seed from any plant that makes the smallest approach. Every step we advance gives new hope for a further progress, and it is impossible to set bounds to an advance of any kind. It was by saving seed from the pansies with the broadest petals that the florists approached by degrees the circular form required ; although it was, at the time it was first attempted, a seeming impossibility, from the natural form of the flower, to even make a step towards it. So it is with attempts to obtain more hardy kinds of any tender plant. It will not be done by sowing things in a season that will not try them, but by trying them in untoward seasons. Sowing peas in the spring will never show us whether they will stand the frost, but sowing in the autumn. We should do the same by cauliflowers : get the plants forward as if they were to be under hand-glasses, plant them out in open situations, make up your mind to sacrifice them, and if there be but a shade of difference in any one plant, seize upon it as a step in advance, and having seen it stand the first frost which killed others, risk not the loss of it by a more severe one, but save the seed, raise the produce the next season to undergo the same trial, and perform the same penance over again ; never mind sacrificing the bulk to

find another that is more hardy than the rest. We need not risk all the seed in one season, lest the first frost be severe enough to kill all ; but plant enough to give us a fair chance, and if we lose a year, it cannot be helped ; but this is the only way to acquire that which is so desirable—a hardier race than we have already obtained. One step that we are told belongs rather to hybridizing than to this department, has been decidedly made, bordering on a hardy race of cauliflowers,—a kind of brocoli that so nearly resembles the cauliflower, as to be frequently sold for it ; but those who are at all acquainted with plants can see the difference at once. It was said to be a hybrid between the cauliflower and the brocoli, but whether it is so, or a sport of nature in the first instance, is immaterial. In looking to those plants that are every year raised from seed, such as the dahlia, it has never been an object to obtain them hardy. The form of the flower being the only point in which raisers are interested, they never look among the seedlings to observe whether one stands more frost than another ; perhaps, if they did, they would find here and there one which was not so much affected as the rest, and by saving seed from them, it is possible they might get others still more able to stand the cold ; but as those are prized most which stray the furthest from their single original, and those which are furthest removed being generally the most tender, we need hardly wonder that among the thousands which have been cultivated for their beauty and doubleness, there is no perceptible difference in their capacity to stand frost. The potato is now being raised from seed in large quantities, and new varieties are offered to our notice every year : let those who raise seedlings plant some of each in autumn, and take their chance ; they are sure to come up before the spring frosts are all gone, if the winter be at all mild. Instead of earthing them up, or giving them the least protection, let them show how they can stand the spring frosts, and if one sort suffers less than the rest, be assured it is an advance ; and that, whether it be good or bad in other respects, it is the one from which seed should be saved to pursue the object of attaining a more hardy kind. In short, no matter what we desire to attain, every trifling advance must be taken advantage of and improved. As to attempting to change the nature of a plant which is propagated from its own wood, that is, from cuttings, layers, buds, or grafting, it is an idle fancy,

grounded on nothing, contradicted by experience every day of our lives that we search among the operations in a garden ; and those who pretend to instruct us show, if we carefully read their lessons, that the plant cannot be altered, by their changing the conditions to suit it. They might as well try to keep water from freezing at 32° , by putting it where the temperature never reaches that point. Whatever changes are to be made in races, must be made by raising new varieties from seed, watching them closely, and trying them at seasons that will show if they advance a single step. This may be profitably tried with many vegetables, with many flowers, but most of all with such subjects as are inclined to sport. All kinds of annuals may be sown in the autumn instead of spring, and if among those that the winter kills a solitary plant escapes, that plant is the one to cherish and to seed from ; and it is only by such means that we can hope to attain any real approaches to hardy varieties of naturally tender races. Many subjects that are now killed by winter frosts might be the parents of better, or rather more hardy varieties ; and it applies to every thing that bears seed, and is now inconveniently tender.

LANDSCAPE GARDENING.

It has been observed by some writers, that it is impossible to reduce this to rule ; that it must be governed by the taste of the architect, and cannot be taught. We will concede the point that no set of rules can apply equally to all places, and that the features of the ground, the nature of the views, the extent of the area, the presence or absence of water, trees, hills, dales, rocks, swamps, and other features, must dictate to a landscape gardener a good deal of his work ; but there are certain rules which can hardly be departed from under any circumstances, and a good deal of useful instruction may be imparted in writing. Nature is our great teacher in this branch of the profession. When we see a beautiful landscape, and are smitten with the harmony of the picture, we may safely study it as a lesson. Is there a straight road ? No. Is there anything formal ? No. Is there a square pond, or lake, or river ? No. If there be one of these, the eye is offended ; if it be not the artificial work of man's hands, it may be wonderful, but certainly not pleasing ; the charm

would be broken. We find in all pleasing landscapes a total absence of formality; and the gardener's task is to imitate the beauties, and to bring into his work as many of the best features as the nature of the ground he has to work on will admit. If the ground be undulating or flat, there must be no sharp turns. A road must be laid down in graceful sweeps; hard lines are always unpleasant to the eye, and must be avoided. Abrupt turnings and elbows are equally objectionable. The same applies to rivers or rivulets which run through grounds. Anything like a straight margin is a complete eyesore: angles are as bad; and whenever such occur, and cannot be altered, they must be concealed. Roads, too, should be, as far as it can be contrived, level, and in undulating ground; the rising, unless very gentle, must be lowered, and each side eased off to a gentle slope on the parts next the cutting. All these things are to be attended to as so many rules; all deviations must be exceptions forced on the gardener; and his study must then be how they can best be hidden by planting, or reconciled by other schemes. It is rarely that the landscape gardener has to deal with barren ground; there is usually a quantity of trees of various heights and kinds. It must be his study to appropriate these to his design, or, at least, some of them. If, however, there be any formality or stiffness in their situations, which is frequently the case if he has to take in fields that have been hedged and timbered, a sufficient number must be taken down to break the line; and on grubbing of hedges, all the common stuff must be destroyed first, leaving any portions that have grown up at all ornamental until a later period of his work; then he may, if he feels inclined, work to them; for it must not be forgotten, that it takes many years to equal things that have grown up well. Not that he is to sacrifice his plan to such an object, but that he must not hastily destroy what may be found highly useful. If a man has an unconditional instruction to form a garden upon his own plan, and to pay no regard to anything that is standing, he will be less inclined to sacrifice any rule than to sacrifice whatever may be there; but there is, nevertheless, as much art in adapting a plan to circumstances, as in carrying out a perfect design, and perhaps more; but, as a matter of cost, some hundreds of pounds may often be saved without sacrificing any general principle; and it is the reckless inattention

to this, in too many artists, that deters gentlemen from undertaking or authorizing extensive works. All landscape gardening should be conducted with some regard to economy; and we mention this because two men may produce results equally good, one having done it at half the cost of the other. Loudon, who advocates a mixture of principles, says:—“There appear to be two principles which enter into the composition of gardening; those which regard it as a mixed art, or an art of design, and which we call the principles of relative beauty, and those which regard it as an imitative art, and are called the principles of natural or universal beauty. The ancient or geometric gardening is guided wholly by the former principles; landscape gardening as an imitative art, wholly by the latter;” but he says, “as the art of forming a country residence, its arrangements are guided or influenced by both principles.” We will not deny that in most domains there will be ample opportunities of indulging both tastes; but the one should be so entirely independent of the other, as not to be even seen at the same time; for the one is perfectly inconsistent with the other, and we consider they may be treated as two distinct subjects. The architect may scratch on paper all he wants of geometric gardening, he will do it to suit his building and his taste; and having done this, the gardener may work to line and rule, and follow his instructions; but let us not compare the one with the other, or mention them as belonging to each other, or having any relation to one another. Pope says, “The principles of landscape gardening consist of, first, the study and display of natural beauties; second, the concealment of defects; third, never to lose sight of common sense.” Wheatly says, “The business of a gardener is to discover and show all the advantages of the place upon which he is employed, to supply deficiencies, to correct its faults, and improve its beauties.” Another takes truth and nature for his guide, and all his rules are comprised in “the unity of the whole and the connexion of the parts.” And Marshall wraps all his up in three words, “nature, utility, and taste.” We confess our notions of landscape gardening to be imitating the beauties of nature, and bringing as many of them together as is consistent with the means employed, and the site we are at work upon; but we do not by imitation mean the mimicry. We have no notion of little waterfalls and puny rocks; no doll’s-

house arbours, and diminutive lakes ; for, above all things, we should lay it down as a rule, that nothing more should be attempted than can be carried out upon a scale sufficiently large to avoid any appearance of art. Nothing can be more contemptible than doing things on a small scale for the sake of crowding more features into a landscape. We do not mean to say that we are to have no rock smaller than Gibraltar ; and no lake less than Haarlem ; that our temples are to be as gigantic as the Coliseum, or our rivers like the Mississippi ; but they are not to be less than nature supplies in those scenes which excite our admiration within reach of our ordinary sight ; and if there be only room for a plain landscape, it is folly to attempt more. We have seen on one acre of ground three or four trumpery fountains ; one broad path with a sweep quite landscape fashion ; some very trumpery rock work, as if somebody had accidentally upset a cart-load of stones ; a pond which would have been crowded by a dozen or two of ducks ; a mound about as large as a good sized dunghill, and on the top a temple, so called, which appeared as if the children had left some of their playthings there ; we had a shallow canal for the purpose of putting over it a rustic bridge, and at a remote corner—that is, as remote as it could be in a place of eighty yards long—a summer-house ten feet by six. But certainly the mansion and its appurtenances were of a piece with the liliputian garden, which, by the way, we had nearly said comprised all the styles—the geometric, the Italian, the old English, and the landscape—and all in sight at once ; reminding us of a tailor's pattern card, or the shutters of a colour warehouse. The mansion was but one story high ; and it had a conservatory, an observatory, a picture gallery, coach-house, stables, servants' apartments over the latter, even with the hay-loft, which held four trusses. Then there was a farm-yard, with its little barn, cow-house, hen-roost, hayrick—this was the produce of the lawn, and might have filled a one-horse cart—a dairy, quite fanciful with coloured glass windows to match the conservatory ; a kitchen-garden, which would have been twenty yards by twenty feet, but a melon ground was cut off it at the end nearest the stable. Some of the boundary was hedged, some walled, some oak palings, and a small portion rustic fence.

Now all this may be thought beside the mark, but it is a general, if not universal failing among owners to cram in all

sorts of objects, and as no landscape gardener who has a name to damage will undertake such work, the merest pretenders are employed, and the place spoiled by attempting everything and failing in all that is attempted. Within three miles of this incongruous mass of things we have mentioned, there was a house with just three-quarters of an acre, of an angular form; a twelve-foot road pretty nearly skirted it, except to allow of a plantation of shrubs and trees in which there were openings that led no one knew where from appearances, though in fact they were to conceal the real boundary, and led nowhere; there were a few judicious clumps to account for the necessary turns in the road, and at the most remote angle from the house there was a temple composed of a facade and four Ionic pillars on a floor raised by three or four steps, and forming an apartment fifteen feet square with an open front. However, all but the front was concealed by trees, and although the eye commanded the whole real space, everything was upon such a scale, that it appeared like a very beautiful part of a large domain, instead of a three-cornered bit of ground under an acre. We mention these two circumstances to show our contempt for the one, and our admiration of the other. And we maintain, notwithstanding all that may be said about mixed styles, that the landscape garden should be entirely free from anything artificial; and as we approach a mansion, or conservatory, or other architectural object where straight lines are forced upon us, let the planting conceal it all till we are upon it. Let us step out of natural scenery to the artificial, but not be able to view both at once. Nobody can admire artificial gardening, or rather formal gardening, more than we do in its place; but what can be worse than the mixture now so common in public establishments,—a long straight road, patched on each side with flower-beds, and a miserable attempt at a landscape within sight? We hold that one or the other should be adopted in earnest. Let the eye fall on nothing but landscape through all the main space, and let the parterres, the conservatories, statues, fountains, Dutch or geometrical flower-beds, vases, orange-trees and general display be shut off, so as to form no part of the general scenery. But according to our definition, the adoption of one style for the flower-garden, and another for the general features, does not warrant the application of the term mixed style. There is no mixture in it. The landscape is to itself:

the parterre is alone. In one we have none but geometrical figures ; in the other we have not a straight line. For even if the boundary be straight, the planting should always conceal it. We have no notion, like Alison, that the landscape gardener is "to create a scenery more pure, more harmonious, and more expressive than any that is to be found in nature herself," for it is impossible. There are rough, and even uncouth scenes in nature ; she has her rugged places, her barren mountains, moss-covered crags, and ugly, cold, and cheerless spots ; but she has features which are inimitable, and he who can approach them in beauty, and harmony, and expression, must be a master of his art. Let the landscape gardener do his best to copy some of the most lovely spots on this earth, and he will find himself at a very humble distance from his task-mistress. But he has one advantage on his side ; he may bring together features which are rarely combined, and therefore produce an imitation, however it may fall short, of scenes which few have witnessed. The bend of a river which is grand in one place, and the style of wood which is beautiful in another, a bridge which is picturesque in a third, a summer-house that is unexceptionable in a fourth, rocky broken ground that gives great effect may be copied from a fifth, and then comes the gardener's art into play. He has so to contrive his scene, that the whole shall harmonize, and although at every step we take, new beauties still break in upon our view, they shall all be in good keeping. Let us now treat of the work under the several heads of groundwork, parks, roads, trees, mounds, valleys, rock-work, lakes, rivers, waterfalls, &c.

THE FIRST STEPS IN FORMING A LANDSCAPE GARDEN.

We must first contrive to get a complete view of the ground we are to appropriate, and the adjoining lands, and see to the boundary. This may be of various kinds in different parts, and the sufficiency must first be attended to. If there be a large space of ground, so that we need be under no difficulty as to scope for our operations, we need not trouble ourselves much about the timber on the boundary line ; but whether it be marked by banks and ditches, hedges, or palings, these must be all made perfect.

Our next operation is clearing the ground. Here we may have to grub up hedges so as to break all the internal lines.

Rows of timber must be so broken as to remove everything like stiffness. There must not be a single line cross the eye. Throw all the worst trees. Save in groups or single trees all that are in themselves ornamental, and that may perchance be worked into the scene. If hedges have been neglected, there may be good clumps of thorn and other wood usually found in hedges, and grown up to a considerable height, and what the gardeners call well furnished—that is, branches reaching to the ground, clumps of trees formed as it were by neglect, but nevertheless rich in themselves. They can at any time be grubbed up, but in the mean time let them remain wherever they are sufficiently handsome. Let this clearance go on all over the site intended to be brought into the landscape. We may then consider where the entrances are to be, from one or more roads; and we have also to consider what foot-paths or roads there may be of a public nature that may not be shut up; and while there may be parts left open to the view, large parts must be shut out by mound, planting or other contrivances, and the whole secured to its own track only by sunk fencing where the view is required across it.

Our next consideration is, whether we can with advantage to the estate, and without detriment to the public, turn the course of such paths or roads, for they are nuisances at the best of times, and the further they are removed from the mansion, the better. To obtain a good view of the whole, we must contrive to see it from the highest places, and with such helps as are at hand. The top windows or roof of the house, or on a high tree, or, if necessary, a temporary scaffolding, must be placed in the best situation. Our plan must be formed then, though not reduced to paper. If the ground be much diversified with hill and dale, the levels must be taken. Undulating ground is very picturesque, but the roads must be cut level, and the sides where the cuttings go through must be formed into sloping banks; but if the ground be a regular slope, or up a long hill and down again, you must consider first whether the expense of so long a cutting would be advisable, and second, whether it will forward or derange your picture. Sloping banks for part of the length of a road are very effective. There is nothing prettier than to emerge from such a cutting; but the banks must be judiciously planted here and there, and they must be neatly contrived to make them picturesque. According as you mean to use or destroy

the uneven surface, so must your preparation be made ; if the ground is to be levelled, all this must be done before you mark out your roads. In short, before you lay down one foot of your plan, all that must be removed must be cleared away, before you begin anything else.

If in looking over your work there happened to be enough cleared to begin, you must endeavour so to shape your course as to appropriate as much of the really ornamental timber and bushes as possible, but you must not be tempted to sacrifice any principle to save a tree. In forming a main road, it is always desirable to bring it moderately near the outside of the premises, and if there be much ornamental wood, the road may be so formed as to command the best view of it. No matter how many windings there are in a road if the sweeps are very graceful, and not in any place abrupt, for convenience must not be sacrificed under any circumstances. The presence of a river or lake must not turn your road out of the way you desire to take if it can be crossed by a bridge ; and here is the great danger of inconsistency. If the scene is to be rural, the bridge should be rustic ; if the presence of art must be manifested, here is room for the taste of the architect to be displayed, but the charm of rural scenery is destroyed at once. A rustic bridge can be made as strong as a fine architectural pile, and the less formality there is, the better. However, we will begin by clearing the ground of all that must come away ; let all the ditches and hollows peculiar to the old partitions of fields, paddocks, and enclosures be filled up ; the ground not levelled perhaps, because that may be contrary to the intended plan, but smoothed on the surface, which may be nevertheless uneven. In landscape gardening, there is not generally any more required of the levelling or smoothing than can be done by the eye and a common level, and even the latter is in few cases wanted. This preparation of the groundwork may be followed by forming

THE ROADS AND PATHS.—From the chief entrance to the mansion there must be a carriage-drive, and this must be continued all round the premises, not exactly on the skirts, but so that the full extent of the premises devoted to the landscape may be seen ; and it must, though it may lead to other entrances, be continued to the main entrance also. As the ground immediately adjoining the mansion is generally in high keeping, and sometimes laid out to correspond with the

architectural lines of the house itself, such as a terrace the entire length of the front, with statues, vases, and the like, the landscape gardener's study should be to conceal all this till you come upon it, and the landscape is shut out. But if the landscape style is to be kept up throughout, so far as all in front of the main entrance is concerned, the more formal portions may be still more isolated. In laying down the road, therefore, use stakes which can be seen at a distance, and mark out the plan by placing them in the centre of your proposed road; let it take a gentle sweep to the right and left of the entrance, not abruptly, but by an easy turn on each side, as soon as the road can be made to do it without inconveniencing the drive of a carriage. When we say that this road is to skirt the premises, we mean that it shall go in some places within twenty yards, and in others thirty or forty, but the object is to give a large space of green. Where the roads part at the entrance, there must be a tolerably heavy plantation, both to prevent the view of the house and to form a reason for the roads diverging; for let it be remembered, that as nature always gives a reason for the absence of straight lines, the landscape gardener must do the same. There must be an apparently natural cause for every turn. It must be because trees, mounds, or water, or some other natural obstacle, prevents us from going straight, and the gardener has to create these natural obstacles. It must always be shown that the road cannot go straight: clumps of shrubs here, a mound there, water in the other place, are in the way of a straight line; and keeping this in view, the road may not only be sweeping round the estate on the dressed part of it, but it may also go here and there in a serpentine figure, the hollow sides being occupied by some proper obstacle, which however may give harmony and grace to the view. Where the road forms, as it must in all of its turns, part of the segment of a circle, the inner side of the circle may be planted with shrubs, forming a clump close up to the road; but in any clump or figure that we may choose to adopt inside, to render the scene broken and yet harmonious, it is that we make a road serpentine, independent of its general direction, which would be round the estate, that we may plant on both sides occasionally; and as we propose from the first, to have a good space to spare on the outside between the road and the boundary planting, this plan of serpentine it affords great opportunity

of varying the planting. There is nothing cuts up a ground so much and detracts from its grandeur of effect more than a number of roads or paths crossing each other. A specimen of this, done too by a London landscape gardener, was the dearest and worst we have seen. A piece of ground which would have afforded a fine bold design had the worst and meanest effect imaginable. Beyond the main road which we have mentioned, and which should be twelve or fourteen feet wide at the very least, and would be better if sixteen, leave all the inside space of park or park-like ground in view ; and if this be cut up by cross paths and other roads, without any excuse for them, the whole charm of the landscape is destroyed.

If there must be other roads, and the space is sufficiently large to warrant it, let there be some temptation to use them. A lake is an object : so if there be a woody glen, a shepherd's hut in the rustic style of building, a boat-house after the style of a fisherman's hut, or any other attractive object, a road may lead to it or past it ; but plain roads, merely passing across plain pasture, are intolerable. There should, for good effect, be a spacious green lawn or pasturage, for expanse is a great object, and although a noble specimen of wood may be tolerated, it is as unwise to cut up the space with specimens as with roads. If we must have other roads, let the same rule be obeyed ; the road must not be straight, and there must be obstacles to cause its deviation : it would look silly to see a road in half a dozen different directions over plain grass, without any reason for not going straight, because common sense would teach everybody, not only to wonder why it went winding, but to give a practical lesson in his own person by going over the grass the shortest way.

To set about making the road, when we have pegged out the direction we mean to carry it, or rather cut it, let six or eight feet be measured on each side, according to the width it is to be, and let the turf, or the ground, be marked with stakes on both sides the row of pegs put down ; and, in measuring this, be exceedingly careful to measure at right angles ; for if the rods used were sloped one way or the other, there would be a less width marked. A very easy way of marking it would be to take a line the exact length that will reach across the road, and let one man go on each side, and having a knot in the middle of the line, place it against the pegs ; stretch the line exactly across at right angles with the

line of pegs, and each set down a stake or peg at the right place as to width, and tolerably close. The gardener should then survey his road before a turf is disturbed; and if he, upon looking and walking along it carefully, sees no awkward bends, but easy sweeps and graceful though varied curves, he may take up his centre row of pegs and have it dug out one good spit deep all over, and thrown out; and the cart, which must bring stones or gravel, to fill up, may take off the loam or top spit to fill up hollow places, or to replace the holes that are made in digging gravel, or to improve mounds, or, if there be no use for it, let it form an artificial mound anywhere, to be removed when required. We are supposing the ground to be well drained, and especially the road part; for unless land is properly drained, half the labour and money expended on it is thrown away. This is the most laborious of all the garden work, but unless there be a good foundation, and the road hard and dry, it is the worst nuisance there can be on an estate.

ROLLING.—After the rough stones and hard materials have settled in their place, a coating of finer gravel must be used, and the whole well rolled down after every shower of rain. The road should be cut level, or nearly so, through all inequalities; and if it ascend or descend a little all the way, the slope should be kept uniform. With regard to the form which the road should be left, it should be rising in the middle so as to throw the wet off to the edges. If the grass already on the land be good enough to represent lawn, or pretty even pasture for park-like grounds, such parts as may have been necessarily disturbed may be sown with grass seeds after levelling; but if the herbage has been for the most part disturbed, each side of the road should be levelled to it at the edge, and new turf edgings a foot wide should be laid along at the whole distance, and the rest be made good.

Paths are like roads upon a smaller scale; but in the larger features of the landscape they should never be less than six feet wide, that three people may comfortably walk abreast; and as the road is more especially for carriages, we may be excused for making a path go a nearer way to the mansion; but even in the necessary deviations to make it take graceful sweeps, we must not omit the obstacles which should be formed by planting, by mounds or other contrivances, and in places it must go through, or between clumps of shrubs, close

to the verges, so that there is good reason for carriages not going the same way; for this purpose the entrance to the path should be between plantations, that it may seem to be what it really is.

If there be a lake, or a rivulet, or a river, it is well to make the path for some distance traverse its margin: or if there be any other object worth a nearer inspection, the path, or a branch from it, should lead to or past it; and if the grounds about the house be shut out from the general landscape, the path should enter it without interfering with the road; and the planting at the outlet, which in fact forms the entrance near the house, should be as plainly indicative of its nature and purpose, and so contrived as to be ornamental, and not so formed as to admit of any lengthened view.

These principles can be carried out on a small scale, or rather on a limited space, as well as on a large one, so that there be enough room to give the desired width; but, if the space be too limited, the path is better omitted; for however small a place may be, roads and paths should seem part of a large one, instead of being reduced in proportions.

TREES, SHRUBS, AND PLANTING.—We have already supposed that there are in places some trees, bushes, and ornamental wood standing, and we now come to their appropriation. On the outside of the road, we have already provided various widths of space which have to be furnished, or to stand as lawn or parterre, as the case may be; and, first, we have to see that palings, or any other fence, be quite concealed by shrubs as high as the object they are to hide; this must be done with shrubs obedient to the knife—common and Portugal laurels, yews and box, alaternus, aucuba japonica, and holly, are among the most useful, because they can be allowed to grow up, or be kept down just as well, and answer the general purpose by aiding us in appropriating or shutting out the neighbouring premises. These shrubs, too, form a diversified and highly effective foliage. These are not to be planted close to the fence, but with room to grow. But this would be a stiff formal border if confined to a row that would just conceal the fence or palings; we have therefore to form an irregular belt. The planting may be brought out twenty, thirty, or even forty feet in some places, in a bold clump, with ornamental deciduous trees at the back and in the centre, consisting of laburnums, thorns of different kinds, guelder roses, chestnuts,

sumachs, acacias, and various other flowering subjects, the purple beech, and various kinds of oak, planes and other ornamental timber; some of these in one clump and some in another. They should be so planned in the planting as to widen gradually in a graceful curve, and then swelling into a bold breast-work, form a circle of noble trees and shrubs, but fronted with evergreens and returning inwards a considerable way back; so that by commencing another curve twenty feet further on, which should be sharper or shorter, the planting being brought out nearly as far as the first, and returning towards the boundary and, as it were, dying off to nothing, there would appear a twenty feet opening, which would not show its termination; it would seem to lead to other and more extensive space than really exists, and as the back would be only fence high, and kept so, there would be no boundary seen.

These little contrivances in planting a belt are too effective to be neglected, and the entire stiffness of a boundary would be lost altogether. We are great advocates for evergreens to form the feature of a plantation; and therefore, in the foreground of these swellings, as we may call them, we should be lavish in the use of the arbutus, various firs, arbor-vitæ, cedars, rhododendrons, berberies, hollies plain and variegated, in all their varieties, and other choice subjects; as we traversed the road then, we should be able to diversify the planting, while winter would be as inviting as summer, because the leading feature, evergreens, would hide the trunks of the deciduous trees, which would merely tower above them, and thus lighten the scene. In the curves on one or other side of the road we should recommend clumps, to be occupied by a selection of one family of shrubs. The rhododendron would form a fine clump, magnolias a second, the arbutus a third, evergreen berries a fourth, hollies a fifth, and so on through whole families. Thus the foliage would be diversified in the different assemblages, while in the very large clumps we might indulge in a mixture with the deciduous trees in the centre, and various evergreens form the foreground. We need hardly say that these things must be planted with due regard to their probable growth, and not be planted too thickly; for such gardens are not formed for two or three years, but for future ages. This is the reason for choosing subjects that will grow down to the ground as well

as high up, for the front, otherwise a few years would leave us their bare legs or stumps, which would by no means be acceptable. The planting therefore requires, first, that we should know the nature and habit of all the things we plant; and secondly, that we should use this knowledge in planting the tallest in the places where they would be most appropriate.

In some of our public parks and gardens this has not been attended to. In the ornamental part of the park of St. James's there is the worst choice of plants, and the worst planting, that can be found perhaps in England; and we fear that in too many of the public jobs, the planting has been dictated rather by the stock of a nursery, or the cheapness of things at a public sale, than by any regard to the taste which should guide all things. The idea of planting things that grow fast in the foreground, and others that grow slowly in the middle, is preposterous, though a good deal too common a practice. Some of our cemeteries exhibit this blunder in an extraordinary manner; but perhaps there is nothing to be seen much worse than may be found in our royal parks and gardens.

As we approach nearer the mausion, our choice of shrubs and trees may be more select; we may add azaleas, pyrus japonica, andromedas, and other choice subjects, because more in sight, and more likely to be appreciated; and along every footpath we should be doubly careful to have nothing coarse or common; not that we condemn things for being common, but coarseness is not to be tolerated. Nor should we indulge much in deciduous plants, unless they were rich in foliage, for the bloom of all of them is of short duration, if we except a few of the deciduous magnolias. We have said nothing of roses, but they would undoubtedly be comprised in the shrubs and trees, as we come nearer to the house, and by the sides of the path; and of these we should have but few varieties, and they continuous bloomers. There might be a dozen kinds perhaps that would almost always be in flower, and these we should multiply instead of seeking for a large collection. If twenty white roses and twenty red were always in flower, in a place that would only accommodate forty, it would be infinitely better than forty varieties, of which thirty would be out of bloom from July to the end of the year. It is one of the most injudicious things that can be done, to aim at possessing numerous kinds of anything that gives us flowers for a short season, instead of aiming to keep up a feature as long as we

can. We hardly know a more discouraging fact connected with collections of roses, than the common result of there being at no time, but a month of summer, half a dozen to be seen in flower; yet we find people sending for twenty or fifty varieties of this beautiful flower, instead of half a dozen each of those always in bloom—for there is hardly anything more ugly than a rose out of bloom,—neither the foliage nor the habit is desirable. We would rather see fifty each of Noisette Fellenburg, the Crimson China, and the pale one, Madame Hardy, Mrs. Bosanquet, and two or three others that are always in flower, than the best collections in the world. The garden would always be striking, and the rosery always beautiful, though there were no other diversity than would be afforded by the few that are growing and blooming two-thirds of the summer.

HILLS AND MOUNDS.—These features are sad blots unless very judiciously placed, or, if on the spot already, very well appropriated. Still they are wanted for the deposit of the soil taken from the excavations, if there be any ornamental water, and as a receptacle for the accumulated rubbish that cannot be used elsewhere. Natural mounds may be considerably improved, but all must depend on their extent. There are many such mounds that only require planting, and some object among the trees to excite attention, and give effect. But in forming a mound, there must be an easy, graceful rise, corresponding with a hollow forming part of the same outline; and, as has well been observed by old writers, lands under the plough for many years may be found with the hollows greatly changed by filling up, and the mounds lowered by the loss of what has been in the course of time ploughed into the hollows. The greatest care will be required in this nice operation, which also involves large cost of labour. Let there be no attempt at a mound that appears insignificant. The impression that a lot of earth has been left that should have been cleared away, is very awkward. There must be no abrupt rising from a flat surface, as is very often the case in manufactured mounds, as they are called in the dignifying language of guide-books. Advantage must be taken of all that nature has done; and it may frequently be improved by additions and changes; that is, by raising it in one place with all the spare soil, and what may be taken from other parts.

TEMPLES, RUINS, ANTIQUITIES.—The top of a mound of

sufficient extent affords, generally, a fine view of the domain all round, and of the adjoining property sometimes. In planting such a mound, care should be taken, as the path winds round, to stop out from the view any object that is common-place or disagreeable, so that the best, and only the best, can be seen. On such an eminence is the place for some building, which should be a resting-place at all times, and an agreeable apartment to spend a few hours in at any time. A temple of some kind is the most appropriate. It may be an imitation of a ruined building; but there is nothing looks more beautiful, when half concealed by trees, than pillars supporting a classic façade, or dome, or some well-executed imitation of ruins, but not upon a small scale. If the walls are not three feet or more thick, and all things in proportion, better leave it for trees alone; for there is nothing more contemptible than the ruins of nine-inch brick wall; and yet it is by no means uncommon. The least appearance of diminutiveness is intolerable: better have a square lump of solid ruin, without any attempt at elevation, than lath and plaster castles that will hardly stand a puff of air. Let everything that is not modern be on a gigantic scale, if there be but little of it. A temple, if the front only were standing, composed of four pillars and a fascia; and supposing it to be a ruin, the remainder only represented by corresponding brick columns and stones, would be effective, if partly concealed by thick trees.

The planting of a mound requires some taste and judgment. We must treat the whole as an antique. It must be supposed to have been on the ground, and to have been preserved. Modern planting of rich beauties would not do for such a scene. Oak would be an appropriate subject for a Druid's temple; but it is scarcely inappropriate for anything supposed to originate in a country where it is indigenous. Still, there are many trees that would be more in keeping with many others. All this has to be kept in mind when we are making an object from other models. It would seem greatly out of keeping to plant modern shrubs as the adjuncts to an antique building; and it should be recollected, that if we could make a feature like this in all respects consistent, a great point would be gained; and in the absence of this, in attempting anything great, we had better adopt at once the model of a rustic cottage, the real or supposed residence of a ranger, or

other domestic, and especially if the place be extensive. The principal aim must always be, not to attempt more than can be accomplished well. If a mound be simply planted, and no object beyond trees be attempted, the wood should be so mixed as that the varied colours of the foliage, whether in perfection or in its decline, shall blend well; or, it may be, that the holly, cedar, the spreading kind of pines, the yew, and other subjects that acquire beauty and interest by age, may lend their united aid in forming a picturesque object from all parts of the ground.

ORNAMENTAL WATER.—But if we have to excavate for a lake, we may dispose of the earth to advantage, in creating a rising ground at one end of it, or for a certain distance along its margin—and no place so fitting for rock-work. And if this be attempted, much depends on the material to be obtained for its execution. It is to be borne in mind, that hillocks, or small mounds, in different parts of a landscape, cannot be approved; and if this be the natural state of the ground to any evil extent, we have at once to determine whether all shall be levelled, and the excess of soil taken to the place where one upon a more enlarged scale shall be formed, or the superabundant earth should be taken to the hollows, to fill up and assist in forming something like an even surface. If the former, there must be some taste exercised in choosing the site; and if the latter, some care taken to lessen the work as much as possible, by judicious disposition of the power at hand, to avoid going over the ground twice where once will do, and by carrying the superfluous soil of a hillock to the nearest place that may be available. Something will depend upon the nature of the sub-soil. It may be discovered that it consists of gravel; in which case, all the top-soil must be saved for the surface: no good surface-soil should be buried. It may be stone boulders, or mixed with large stones. It may be rocky; in such case, there is a temptation to form rock-work on a large scale; and the material being on the spot, it would be comparatively less expensive.

It is from this importance of the sub-soil that we direct levelling before road-making, because, if the sub-soil be gravel, or stones of large size, the material for the road is ready; and if the stones be too large, they must be broken. Nobody, in fact, should attempt to move in any of the operations without

boring or digging, to see where, or how, he is to find material for the roads, and enable him to determine what features of the ground he will preserve, and what destroy. All those authors who treat of landscape gardening, more or less liken it to the art of the painter, who can bring upon his canvas the beauties of half a dozen different spots, and yet make them all harmonize. But the material difference is in the execution. The painter can represent a mountain, a river, a waterfall, a cascade, trees of five hundred years' growth, and rocks immovable; but the landscape gardener is limited by want of means, and cannot perform miracles. There is as much difference between the painting and the reality, as between a book of travels and the journey. The painter has no limit: his poetical imagination may run riot in great works. He can bring the Ganges, where only the Thames runs, to water the meadow of Sion House, and the pyramids of Egypt to Salisbury Plain, as companions to the Druidical remains. If he make his scenery harmonize, and form a good landscape, it is all that is required; and the landscape gardener would do just such wonders on paper. But in practice he must be guided by the scenery he has to begin upon, and the improvements which are practicable. His mountains may require to be erected by cartloads; and for every hogshead of water that his lake is to contain, he must remove a corresponding quantity of solid earth. Loudon recommends the study of landscape in paintings; but we consider nature will do enough for the gardener. He can form in his mind a tolerably correct idea of what he can imitate, when he looks on the reality; but if he once allows himself to be beguiled by the pencil of the artist, he may be deceived.

It is almost impossible to walk out in the woods and forests of our own country, without learning something practicable. The groupings of trees, the effect of broken ground, the commanding views from hills, and the rising ground from valleys,—the turns of a river, now gurgling over a broad bed of rough stones, anon rushing, in a rapid narrow stream, between high banks, and then swelling out into a broad and comparatively smooth lake,—are all so many lessons in the art of landscape gardening. But in nothing do we find more instructive hints than in the various groups of trees, and the wooding of various mounds; some of which are covered, others only patched, but all more or less ornamented with foliage and verdure. From

every one of these groups and mounds we may take a useful lesson. We may expand our ideas of variety and propriety according as the scene pleases or annoys us. It is by visiting established gardens, with a view to criticise them, that we can learn what to avoid. A man determined to learn, will, in his visits, see many of the extravagances which we have pointed out as objectionable, and will at once see the justice of our condemnation.

Although a valley is almost always the companion of a mound, or something more, we must treat of them separately.

VALLEYS AND LOW GROUNDS.—The management of valleys is just the converse of mounds ; but we have to aim at great ones, for mere hollows, as if the earth had been robbed of its soil, are eyesores, and must be got rid of. If, as is not uncommon, there is a hollow or valley running across an estate, it may be questioned whether it could be improved or should be destroyed. These are often wet in the winter, and almost a river of water ; and if so, some means must be provided for getting rid of this, by constructing drainage before we can either fill up or break the stiffness of the line, if it be so. If it be a decided hollow, with rising ground all round it, the bottom must be the receptacle for all the rains and draining of the surrounding ground, and part of the year, at least, partially filled with water. This must be improved or got rid of ; an unmeaning swamp at the bottom of a hollow is not to be tolerated : make it water, if it cannot be drained ; and if neither can be done, fill up, as far as it is practicable, with stones and any other rough material, as far as you can, and lessen the hollow as much as possible, by raising it in the middle, and at least forming a shallower basin, which will be dry, because it will drain into the rough stuff as fast as it runs down. But, presuming it to be of any bold and formidable extent, at once make a piece of water there, by puddling it well as far as the water is to reach, then drain all the surrounding land into it, and otherwise keep up the supply ; give some consistency of form, plant the sides appropriately, construct a small boat-house which shall be ornamental, and plant with water-lilies and other aquatic plants ; convert the banks, or sides at least, along a portion of its margin, into rock-work, or adopt any means to render it a feature. But all small hollows must be filled up ; there is nothing more

objectionable to the eye than holes and lumps ; and if the former have been made by excavating for gravel, or soil, or chalk, and present, by their extent and number, direct obstacles to the filling up, there is nothing left for us but to plant and conceal them ; whereas very extensive hollows, large enough to be turned to good account, may be made very interesting features : by breaking their perpendicular sides into fragmental ledges and rocky projections, by supplying them with appropriate plants, by reducing the bottom to some picturesque form, that which would otherwise be a most exceptionable blemish may be converted to one of the most interesting features. It is impossible to convey lessons to meet such a case, because there are no two such places alike in anything. The design would depend altogether upon the depth, the extent, the nature of the material, and the situation : all such places have roads sloping to the bottom, which have been used to draw out the material, and this road must be rendered picturesque, by the breaking of the sides and planting them,—by turning it if straight, by widening if too narrow. There must be some object when we get there—a gipsy hut, a hermit's cave, a grotto, a fountain, or some other object, if it be but a garden-seat, or the tomb of a favourite dog, or, as Pope had, in his underground passage which communicated between the premises on either side the road, the busts of literary and bosom friends. Such a place might be devoted to some such purpose, and embrace memorials of departed great men. But all this is fancy ; if the places are of noble size, and the banks or sides capable of forming extensively picturesque features, there would be no occasion for any half so gloomy. At Rosherville, the premises are nearly all excavation—the high portions are in the minority, and are the exceptions ; but there are portions from which useful lessons may be taken as to the best means of treatment, from upright rocky sides, to deep and extensive hollows. Nothing could be more appropriate than to turn the sides of such a place into a Rockery, which would beat in effect anything that could be attempted in an artificial way alone. The breaking down of the sides must be judiciously managed ; but this belongs rather to another section of our work.

Gravel pits are of the same nature as chalk or marl pits, or stone or slate quarries ; the sides are frequently as perpendicular, but not nearly so easy to manage, for they can only

be made into regular shelves or an even slope, whereas marl can be formed into anything, and slate or stone is as convertible as chalk, though perhaps not so easily worked. The planting round such places, to conceal them, often leads to accident to man or beast, and if the soil be very dry, it is a question whether it would not be better to work away the sides into the bottom, and thus convert a dangerous hole into a valley, the more extended the better, although attended with great labour; all these things must, however, be taken into consideration before we commence, for indecision is fatal. Until we have made up our minds what to do, we must do nothing; and when we have determined, no ordinary circumstance should turn us from our object; not but our coming upon springs, or any other undiscovered change of character in our work, may induce, nay, force us to alter our design; but we must then reconsider, with the new circumstances in our mind, and not move again till we have again decided. We may have to form a lake, or a rivulet, or fall, where we did not intend, but we should never go on upon speculation as to what we should do next.

ROCK-WORK.—We have already mentioned this subject, and pointed out some cases where its adoption would be judicious. If we could command it, we would have water at the foot, that there may be a seeming consistency in the picture, but, as this may not always be, and the work may in some cases be almost done to our hand, we must not lay down rules too arbitrary. The first thing to impress upon the mind is the necessity of boldness, roughness, extent; for the idea of rocks which a man can see over, and almost stride over,—and this may be seen at public nurseries,—seems to us to be the height of absurdity: a rock should be noble; if a man of taste has not to look up at it, he will indeed look down on it; it is as contemptible as a doll's house, or a child's plaything; too diminutive to show what it is meant for, it looks like what it is not meant for, and nothing can be more paltry. We have said, ere now, that rock-work may be made of any size, from a barrow-full of stones thrown down on a heap, to the rock of St. Elba, but this was in allusion to its adaptation to plants; a rock made of two bricks will do to nourish, and yet to supply the necessary drainage to a plant, as well as if they were heaped mountains high; but in reference to landscape gardening, rock-work should be twenty feet

high or nothing ; the only excuse for anything lower would be to cover a mound with fragments of brick, flints, stones, and slates, and each appear like the rock merely protruding through, which, when covered with plants, would do better than any paltry elevation. But rock-work is one of those features which are not necessarily part of a landscape garden, and unless very judiciously managed, and of a respectable extent and elevation, is far better omitted.

The temptations to construct rock-work are, first, the presence of abundance of appropriate material, which would be in the way if not so appropriated ; second, the presence of water, which is one of the most important adjuncts ; thirdly, portions of high broken mounds, easily convertible to rocks, so far as the surface is concerned ; fourthly, the presence of excavations of any kind not easily convertible, nor without immense labour filled up ; lastly, the presence of a deep valley which is to be retained. Any, or all these circumstances, naturally tempt one to introduce rock-work ; and in constructing this, the evils to be avoided are, first, diminutiveness, than which nothing is so destructive to the harmony of the picture ; second, smoothness, which detracts from the grandeur, if not absolutely from the natural appearance of rock ; thirdly, choosing a bad place ; fourthly, not attending to the surrounding, or at least the adjoining scenery. A rock built up in the middle of a lawn or park would look exceedingly ridiculous alone, but a rocky scenery on the margin of a lake might be perfectly natural ; the place should be a gradual hollow slope from near the ground upwards, the outer surface being made with chiefly very large fragments of stone, or material in imitation of it, so as to form a bold rugged face ; and here let it be above all things remembered, that rocks are not in nature formed of lumps of glass, bits of carved stone, broken ornaments, and such like, as one would fancy they were from looking at scores of garden establishments ; they are either chalk, or granite, or quartz, or sandstone, or some other distinct material, and their fragments are all of the like character, although not two may be of the same size or likeness. We have seen a very distinguished amateur rock-work, which has been so managed as to evade the responsibilities heaped on us by the second commandment ; it is like nothing "on the earth beneath, nor in the waters under the earth," patched up as children make grottoes—not those with oyster-

shells, for they are at least all alike, but like those which ingenious youthful architects make with glass and beads, bits of coral, and so forth, as if—and perhaps it is so—the value of the building were to be estimated by the variety of materials on the face of it; and when we expressed surprise, we were directed to a dozen more in the metropolis, some in houses, some out of doors, but all looking excessively small, and very ridiculous. This, therefore, above all things, should be avoided; and we earnestly beg some of our most distinguished amateurs to blow up their rock-work as soon as they wish to get rid of the responsibility of enforcing by example a very bad taste shown under the auspices of very fine plants and very good establishments. The plan of your rock requires as much architectural taste as the plan of your house: let the crags and interstices preserve a character as if the rock were real; beauty, as some people would call it, must be sacrificed to propriety. We would rather see rock-plants growing upon the imitative ruins of a broken down castle than upon some of the kinds of so-called rock-work that grace very high places. There must be no one-sided contrivances, no back that is not fit to be seen, no blemishes to be hidden by plantation; what is proper in one place is proper in another, and the only varieties that should be seen in the different faces of the rock should be only such as could be seen in nature.

The Isle of Wight affords many fine specimens of inland rocks, which might be studied with advantage; and both Wales and Scotland, as well as Derbyshire and Devonshire, give us splendid examples. We may find rocks of all sizes, and fragments of rock on one another, but nothing so contemptible as the affectation of rock-work in modern gardens. Avoid, then, this puny work; countenance nothing but such as will be creditable as to size and character. In excavations, where the sides of chalk-pits, or stone, or slate-quarries, are almost perpendicular, these sides must in part be broken down to a slope of crags, leaving a portion upright just where it may seem to aid best the general effect, and the falling of the sides as they are disturbed will almost form the work without the labour of the mason or the architect; at all events, the work will be greatly facilitated.

When rock-work is constructed by the side of water, a path must be made at the foot, or there must be some standin-

place, unless it happens that the water is so constructed as to enable it to be well seen from the opposite path. On this account it is better to carry out a sort of bay, round two-thirds of which the rocks can be so constructed as to form a kind of rough amphitheatre, so that those standing at the entrance, or near it, may see pretty nearly all without going nearer. There must be no uniformity in the construction of the rocks, and the plants selected for them must not be the diminutive little alpine that you must be close to before you can see them, but for the most part the bolder kinds, which are a feature in themselves, and such of the smaller ones as are covered with bloom; and as there will be great fissures provided, as well as dry and shallow receptacles for soil, even shrubs and trees of appropriate kinds may be planted and grown to advantage. The tops of the rock-work must be composed of bold crags, here and there, and the outline must be broken by gaps; some of the pieces should be broad on the upper part, and form wide shelves, and in all parts the features, as it were, should be large. On the land side great attention should be paid to the natural construction, and the lower part, near the ground, may be strewn with fragments, among which plants of various sorts should be growing. The crags may be also bold on the land side, and the plants from top to bottom equally choice and varied. If a mound forms part of the height on the land side, it is perfectly natural, as in mountainous places the rocks protrude sometimes half-way up, and generally in patches, up the whole face of the mountain; and so also with smaller hills and rising grounds; but all this will be very trumpery if done on a small scale.

With these general remarks, our friends who are desirous of making rock-work will be able to set about their work with right notions; and many who think they have rock-work, because they have a few clinkers and flint stones piled one above the other, will be as anxious to destroy the vestiges of some party's simplicity. If we have not the means of forming proper rock-work upon a scale of sufficient extent, the next best plan is to have it built with bricks, but still to adopt a style of some kind; but always—for we cannot impress this upon the mind too deeply nor too often—make it large enough, or not at all. An artist of some celebrity in imitation has recently completed a jumble of something be-

tween ruins and rock-work, and we hardly know what to call it : we cannot call it rock-work, because there is nothing like rock about it ; if a nine-inch brick building had been melting away instead of tumbling down, and when it was half melted had suddenly congealed again, we might, by a stretch of fancy, consider the work in question a representation, but it has melted holes in the walls, and these are furnished with little white heads that seem looking out with astonishment at the change which has been wrought. A shell or two here and there looks as if somebody had been pelting the inmates while the walls were in a state of fusion, and they had stuck there. And this, be it mentioned, has been executed by an artist in rock-work for a gentleman who held him to no price, but wanted good rock-work. The heads and shells do not match each other : if the head of old Neptune had been looking out of one hole, and a mermaid's head, with her comb and glass, had figured at another, they might seem at home among the shells, but to see Mercury and Milton at the holes in the wall seems perfectly *outré*. We have digressed, because to show up prevailing faults is no bad road to improvement ; and we have not told people what we dislike without also telling them what we approve. We may, however, be wrong after all, and particularly if, as we are told by some, landscape gardening is subject to no rules, and cannot be reconciled to any principles, but depends entirely on the taste of the gardener ; for if so, all we have done yet is to show that our taste differs very materially from that of many other persons.

ROCK-WORK AND RUINS TO PLANT.

These two constructions are the same kind of receptacle for plants, and what thrives in one will thrive in the other. The most effective things are ferns, and these should occupy most of the prominent places ; but now and then a yucca will look well ; it is a noble looking plant, and its foliage, though equally graceful in its way, forms an excellent contrast to the finely divided leaves of the ferns. As a commencement of furnishing these buildings, mix up a paste of loam, about as thick as the paste used by paperhangers, into this put seeds of hardy ferns if you can get them, antirrhinum, wallflower, catananche, alyssom, veronica, primrose and any other flower you ever saw grown on a wall ; mix

this altogether, and beginning at the very top, by means of a ladder, paint every ledge, and fill every little crevice with this mixture ; as you come down, paint the top of every ledge and roughness where a plant could lodge if it grew, do not leave a single lodgement without its share of pudding. Some of your work will go for nothing, because the sun and wind may burn up or dry anything that germinates, but your labour will not be without its fruit. As you come to pockets, as the holes left for plants are called, fill them with soil, which must be handed up to you, and put in your fern ; when you procure them you will learn what situations they want, to what size they grow, and other particulars. As you come near the bottom, some pockets are left larger for more conspicuous plants, and near the ground you will have room to put little blooming plants in front of the ferns, such as lobelias, calceolarias, scarlet geraniums, verbenas, anything dwarf, for it matters little how it is finished off. For the summer months you may find several very important subjects, that are conspicuous to put in the neighbourhood of the rock-work or ruins, such as brugmansia, which may be put out in May, fuchsias, which may be in conspicuous situations, and put out already in bloom ; some of the saxifrages may be put on broad ledges, and against upright walls, pillars, or columns ; ivy must be proved to climb and cover. In a few months you will see the effect of your *pudding* ; some one or other of the seeds will germinate in every place where the wet can lodge, and where nothing else will grow, you will find moss. The soil in all the pockets of rock-work and ruins should be rich in vegetable mould, because everything will grow in it ; in fact, all the soil you find on places where it has not been put, is vegetable, mosses begin and decay, grow up again and decay, larger things spring up, and in turn decay, until it will carry ferns ; therefore the mould used for the pockets should be half loam and half leaf-mould.

WATER, AND ITS APPROPRIATION OR ADOPTION.—If the ugliest and poorest stream of water runs through grounds that are to be laid out or improved, it is certainly convertible to ornamental purposes. It is not necessary that water should be deep because it is wide, or that the supply should be bad because the stream is narrow ; but the plan of boring for water is now reduced to such a system, that it is only a question of expense, and where a supply of water is short or

doubtful, it is better at once to provide it. But many streams, however small, may be made ornamental by first opening the bed of the water, or rather the channel, to a proper ornamental figure, widening it where desirable, and so adapting the outline to the place and plan of the work, as to secure a picturesque and natural appearance.

WATERFALLS.—But it may be, and generally is the case with streams that are insignificant in appearance, that it arises from the too rapid descent of the channel. In this case begin by damming up the lower part, where it leaves the ground, high enough to fill up to the banks there, and as they may not fill it, a long way back other dams must be placed across higher up, to fill it there, and so on, that it may form a series of smooth water and falls, entirely through the ground. All these falls may be made ornamental; that is, a bed of stones on the lower side of the dam may be piled up against it, and made perfectly solid, that the water, little as it may be, shall run over the surface, and not be lost to appearance by sinking into them. They can also be made rugged, and portions of them reach above the dam to drive the little water there is through less openings. Nor need the stones be in a line across the river; they may imitate a natural barrier; but it need not be mentioned, perhaps, that whatever width the bed of the river be made, so that the bottom be puddled and the sides made to retain water, the stream will fill it, and then allowing for increased evaporation and waste, the supply will go over at the bottom; so that a very inconsiderable rivulet will be readily converted to a respectable river, and perhaps may be aided very much by tile drains from the higher grounds run diagonally into the stream; or if more water be absolutely necessary, we must resort to boring.

All rivers are capable of improvement, or the grounds that immediately join may be so managed as to greatly improve the appearance. The most awkward to manage are those whose bed lies very much lower than the banks. Here we must resort to damming up the water as before mentioned, but presuming there is a good supply, it will make a respectable cascade at some—the best adapted—part of the ground towards the lower end of the stream. But it may be that the river turns some mills, and that there are other obstacles to the damming up of the water; in this case the ground must be lowered near the sides of the river to the water's edge,

and be gradually sloped off to make an easy sweep down to the water, that the view may not be hidden by the banks, which would naturally conceal the river from sight at a very small distance. In this case the slope ought to be carried to a considerable distance, say twenty yards, so as to be able to avoid all appearance of abruptness, and show the whole width of the stream a long way before we arrive at it.

It is quite reasonable to suppose, that water is too great a treasure in a good domain to be lost for want of some care and expense, and that all the means of preservation would be used that could well be applied. Now, presuming the water, as in the first instance, be scanty, every little that could be returned to the head of the river would be an object. By applying the water-ram, (an ancient implement, but now rapidly coming into use,) at the outer fall, a considerable quantity could be sent back through pipes some hundred feet, and as the instrument is self-acting, the only expense is the first, and the greater the fall at the lower end of the stream, the more powerful and effective will be the ram. We have seen this simple instrument the means of forcing water to the top of a house to supply cisterns for all purposes of the establishment.

FORMATION OF LAKES.—But it may be that there is no water, and that we have to form an ornamental lake. Let the size be in proportion to the work all around it, not a mere duck pond, but more rather than less than can be afforded for the space under management, for nothing can be more ornamental. We remember once being betrayed into making a mere pond for gold fish, and unfortunately instead of its being among the avowedly formal part of the garden, it was placed on the lawn, which was laid out with its roads and plantations in true landscape style. As it was a brick and cement affair, thirty feet by fifteen, there was no moving it; but we were soon determined to plant it out as a nuisance, instead of pointing it out as a beauty. Such things are not for landscape gardens; they are for parterres in the neighbourhood of architectural beauties, and not for rural gardening. Nothing could be more paltry, nor was there anything about the place of which we were so much ashamed. Let your lake be of any odd shape, or no shape, if you please, not with angles and corners, but such outlines as nature gives us in her ordinary

works. Study to avoid formality, and make the excavation from two feet on the sides to six, or say five feet in the middle. If you come upon soft places, go deeper there, in the reasonable hope of coming to springs, for a supply of water is a most important part of the affair. According to the nature of the ground, so must you determine to puddle the bottom and sides, or otherwise. If you are digging in clay it will retain the water, but if in gravel or sand, or loose soil, the entire bottom as well as sides will have to be puddled, unless springs come up through the sand, and fill your pond. But it frequently happens that springs will fill your pond up to a certain part, and that the loose ground takes it off there,—in short, that no supply will keep it above that mark, which may be a good deal too low for appearance or use. Nothing but puddling can avail us in that case; and puddling may be explained to be the making of a lining with well-kneaded clay. If we are obliged to supply the water from other means, it is but to confine the depth to about four or five feet at the deepest part, and two feet on the sides, but of the saucer form of hollow, and then putting well-kneaded clay all over it, and setting men with rammers to beat it, or rather run it out into an equal bottom of about nine inches to a foot in thickness—for well-worked clay is as impervious to water as if it were baked—this puddling is to be worked up the side to the very edge, and it will then retain all the water that is put into it, except what goes off by evaporation. As, however, lakes must be made at the lowest part of a domain, and all the land around may be drained into it, we are seldom compelled to puddle any more than the sides for a few feet in all round. We should never choose an estate without water, and we should lay out the whole of it, even choosing the site for the house with some reference to a good view of a part, if not the whole of it, though it would enter into our plan to conceal it here and there by planting, to break the line of the edges of it; for we can conceive nothing more naked than water without wood.

FOUNTAINS.—These belong to the formal portion of gardening, but the making of them may be treated of in this place as part of the management of water. We need hardly inform the amateur gardener, that neither fountains nor falls can be produced without a head of water; and this must be either supplied by the nature of the place, or by force-pumps. If we

possess the head of water by means of springs on high ground, the construction of the fountain is simply by means of a pipe to convey the water to the lower ground, where the jet of the fountain is placed ; and here it may be necessary to hint, that the lower the design is formed—that is, the nearer it is to the water—the higher it will play. But if we have to form the head for the purpose of the fountain, the nearer it is to the work it has to do, the better it will be done. Generally, it is by means of a large tank ; and the water is pumped up by horse, or manual, or steam-power, from this tank, which should be concealed, or be placed on the top of some of the offices, so as to be a part as it were of the building ; the same head of water may be made to supply the mansion. Where the water is supplied by power, the fountains need not always be playing ; but with a natural head of water it is of little or no consequence. Fountains are as various in their designs, as any other object in a garden. They may be made to play in a circular basin where gold and silver fish are sporting, as at Hampton Court ; or they may be made to spirt or run from grotesque figures, as they once did at Moor Park, where one figure was a washerwoman wringing out clothes which the water was running from, and a drunken man was in the agonies of extreme sickness, with the water gurgling from his mouth ! Strange as this fancy may appear, we saw the leaden figures at Rickmansworth, not ten years since, and they were specimens of extraordinary talent in modelling. We mention these to show there is no limit to the fancy, even to the indulgence of the most costly and artistical excellence, to carry out a vulgar taste for which even the extraordinary merit of the artist hardly compensates. We do not mention this for imitation, but to show that almost anything may be adopted for a fountain, so it does not outrage nature and taste. Lions' heads vomiting water are common ; but the most unmeaning and senseless subjects are as common as anything ; thus, a figure spouting up the water from a horn—one would think the imagination poor indeed that could not find a better subject. A dolphin, or any other water monster, spouting up water after the fashion of a whale, and whose figure would be half out and half in the water, would seem more natural, and it would have the advantage of being closer to the power. For be it remembered, that if water will rise ten feet, every foot that is taken away by the pedestal and figure has to be

deducted from the jet ; therefore anything close to the water's surface will give us all the power in the jet.

ARTESIAN WELLS.—Where the springs are favourable and the water will rise above the surface, these are of the greatest value and importance ; because tubes may be put on the outlet and carried up as high as the water will go, and may be conveyed to any part of the premises below its upper level. The Artesian well is a hole bored in the soil, not more than a few inches wide, and is adopted where a good supply is wanted and water lies very low. Many wells in this country have been sunk 300 feet deep, and even then there have not been many feet of water. If the main spring had been penetrated in those cases by the boring system, it is just possible the water might actually have risen to the surface. Now, the boring for water is a very common practice, and although the spring may not rise to the surface, or within a certain distance of it, the well has only to be sunk deep enough to hold the necessary supply. The depth of the bore, to reach the main spring at any particular spot, is a lottery ; the land-springs may be reached in a few feet, but a supply from this source is uncertain, and is always affected by the weather—sometimes, indeed, the land-springs are all dried up, and great loss of labour, time, and money is the result. The professional borers for water can frequently tell at what depth they will reach the main spring so nearly, that they will contract to do it at a price. The certainty of a supply from this source, and the known superior quality of the water, render it an important feature in an establishment. We know that at the Duke of Buccleugh's seat, Richmond, water was once supplied to the first, and, we think, the second floor, from an Artesian well ; and that the main spring is affected to a great distance by every new intrusion of the borers' apparatus is certain, for we know the Duke's was lowered several feet by a new well bored on the opposite side of the river Thames. One of the first inquiries on looking at an estate should be about water. We remember being called on to give our opinion as to the eligibility of an estate in Surrey, and on entering the farmyard we saw what to us was enough for us, and "won't do" escaped us before we had gone ten yards into the premises. We addressed a labouring man who was in charge of the place : "Who do those two water carts belong to ?" "They go with the premises." "What use are they ?" "We have to fetch

water for the house and the cattle with one, and the other is to bring it for the garden." "Is there work for both?" "Yes, very often they are at work all day." "Where, then, is the abundance of water mentioned in the particulars?" "There's a pond and pumps, but the gardener says it kills the plants, and it won't do to drink." We merely turned to our employer and reminded him that such a place would not be cheap at any price. It turned out that water for the garden had to be fetched a mile up hill from a pond at the foot, and that for the house had to be brought two miles. The gentleman for whom we acted then told us that he had bought the place at an auction, and paid a deposit; but we held that abundance of water would be taken to mean abundance of water that could be drunk, and that the property was misdescribed; and upon that a compromise was effected. This was many years ago, and we knew very little of boring for water; but the price of an Artesian well might make such a property very desirable. The idea of keeping two carts, two horses, and two men always on an establishment, to supply the water is preposterous; and yet when rain supplied it they could not get rid of the horses, carts, and men. These wells cost something considerable when they have to pierce deep; but, where there is a scarcity of water, they are valuable.

Boring for water in some places forms a powerful fountain. At the Tooting Nurseries, Messrs. Rollison have had a boring which carries the water a considerable height with no sort of confinement but the tube, and the supply is immense. In other places, however, it has been found difficult to bring it up to the surface. The fountains in Trafalgar Square are supplied from a considerable head of water obtained by steam-engines from an Artesian well; and although there has been much difference of opinion as to their claims on the score of beauty, there is water enough and power enough to form any kind of jet. The intention of the artist seems to have been to limit the height to which the water is thrown very much, and they never look better than when the jet is at half-height and spread a little, for the figure is then consistent; when playing at the full height, the basin is not large enough to look as if it belonged to the jet, and the least wind destroys the effect altogether.

AQUARIUMS.—Although ornamental waters of any kind may

be called Aquariums, it is only applied to those in which plants and water animals are professedly kept. If we passed a pond full of water plants and fish, we should only call it a pond or canal; but in proper aquariums, to show off plants, fish, and reptiles, some attention should be paid to the construction. In ordering ponds and canals, many choice specimens requiring shallow water would be lost; but it is possible to render them capable of growing everything in perfection by constructing steps, as it were, at the sides. In some places it may be filled up to leave a depth of six inches in for a certain distance, and the next shelf, as we may call it, may be eighteen, or it may go shelving off to that depth, and plants may be sunk in pots or baskets of proper soil; but in no case should the water be very deep. In constructing an aquarium which may be adapted for all the interesting plants, it is best to make the bottom like a flight of steps, to accommodate all the species intended to be grown; whether it be under glass or otherwise the construction may be the same. The supply of water should be gentle, but constant; and where it is abundant it might be in the form of a fall, and reach pretty nearly the whole breadth at one end; a pipe drilled full of small holes may be made to supply a range of artificial rock and trickle down it in twenty places, and the pipe be nevertheless concealed from view: but fancy may originate fifty different contrivances to convey the water without its entrance being in sight, though it greatly increases the interest of the scene if the supply be made a feature. In aquariums out of doors, we strongly recommend the addition of rock-work, particularly if the work is to be on a large scale. The construction of an aquarium with rock-work at one end, or partly surrounding it, gives an opportunity of growing a fine collection of ferns, some of the most beautiful of which thrive best where there is a supply of moisture; but it would be difficult to lay down any rules except so far as provision is to be made for holding the water. If it be necessary to excavate for it, we have to choose between puddling it all over the bottom and sides with clay, or building the interior with brick and cement. If it be on a large scale, puddling will be necessary; if on a small scale, it is better to resort to brickwork. As we have intimated, provision must be made for various depths of water, and the excavation must allow for six inches of puddled clay; and unless the clay be

kneaded until every particle of air is excluded, it will not permanently hold water. When the excavation is made, the clay must be put all over the bottom, and beaten or rammed down with round-ended rammers, about four inches through, and smooth, until the whole is a solid coating all over the bottom and sides. It must be moistened while it is rammed, and gone over many times. There are men used to this sort of work, who may be profitably employed, instead of its being attempted by men not used to the business: and when we have a puddled bottom, it is better to have a gradual slope from very shallow edges to the required depth in the middle. It is desirable to have a rise in the middle, to form a sort of island, where amphibious subjects can rest. The method of planting these waters is simple enough:—All the various aquatic plants may be sunk in pots, pans, or baskets of soil, in deep or shallow water, as required for their growth and proper development; and the rockwork should be built with pockets for sufficient earth to sustain ferns, yuccas, and such plants as exhibit their foliage to advantage. It is a mistaken notion to depend on the favourite little Alpine plants which we too often see almost exclusively grown on such places; and, moreover, there are many water plants that are but little use. All the hardy water lilies are worth a place: some of the flags and rushes are interesting, because they make a feature; but inasmuch as there are many really fine subjects, striking to the eye, as well as interesting, a good thing had better be grown in plenty than the space filled up with insignificant subjects only interesting to the botanist. Whatever water may be on the premises may be converted into interesting scenery, and adapted for water plants by simply filling up portions that are too deep, changing the outline, and adding rock where the water is already standing. There will be no puddling required; and if it be not high enough, lower the ground all round to slope down to its edge, or sink the surrounding soil to a flat path, only a little above the water, and form a sloping bank all round the path, portions of which may be covered with rockwork, sloping down to the water occupying the space that would be devoted to path if it went all round; because if the rock occupied the space half round the edge, it would be of no consequence. The so-called aquarium out of doors is a most indefinite affair so far as extent is concerned, for we

have seen almost every hardy aquatic worth cultivating in a canal a hundred yards long, and certainly the water abounded with almost all kinds of fishes : but we take it that water beyond a certain limit belongs not to the received notions of aquariums. Under glass, where there is something like taste in the construction, and we may see to the bottom and witness the motion of the animals the water contains, there is something more deserving of notice. For an example, we will mention the aquariums at the Crystal Palace, where the higher temperature enables the directors to cultivate some of the most beautiful subjects, and keep alive many extraordinary examples of natural history. The splendour of some of the flowering water plants is far beyond anything we can grow in the open air. But we may mention Vietche's, in the King's Road, where most of the rare aquatics are cultivated for sale. Those at Sion House, Kew, the Manchester Botanic Gardens, and others, which were constructed for the purpose of growing the *Victoria Regia*, are examples that have been since followed by many. Aquariums on a small scale—merely vessels of glass, in which plants, fishes, reptiles, beetles, spiders, and other living things are kept—have become almost as fashionable as Wardian cases ; and one dealer in the subjects for furnishing them—Brigdon, of the Railway Arcade, London Bridge—actually keeps thousands of plants and animals always on sale ; and we have seen, in his glass cistern, turtles, lizards, fishes of all kinds, little ugly monsters, that one hardly fancied were in creation, sporting about as lively as if they were at home, and that, with some of them, was thousands of miles off.

The aquarium formed with glass sides should not be more than twelve or fifteen inches from side to side, and two feet deep, but from end to end may be any length that will fill a window. Clean gravel and sand should cover the bottom ; and a few shells may be added in artificial rock. The best mode of inserting plants is to put them in shells, with proper earth, and sink them to the bottom ; some, however, will root in sand : and as some very interesting subjects among the beetle tribe and others will destroy or worry fishes and equally interesting animals, it is better to trust to those who furnish aquariums, for a set of appropriate subjects, than to pick up things at random. All fishes are interesting when small, but come will not thrive ; and it has only been ex-

perience that has taught which does : and it is better to leave the choice of plants also to the dealers in these things. We have seen, at the depôt already mentioned, aquariums completely furnished ; small eels, bull-heads, flounders, gudgeons, and loaches, moving about the bottom among the roots of the plants, which were growing out of artificial rocks, shells, and the sand itself, or swimming on the surface with their roots descending almost to the bottom ; gold-fish, roach, and dace, sporting about in the middle ; lizards of many colours, water-spiders with bellies of burnished silver, and beetles, lying on the surface, and anon descending to the bottom and returning ; the whole scene animated, and when the body of water is only twelve or fifteen inches through, they can be seen well if they are on the opposite side. We need hardly say that the choice of plants for these miniature structures is very limited, because many very fine things grow too large. It is obvious, too, that numerous small things, which are interesting when they cannot get out of sight, would be lost in larger aquariums out of doors : but as house-gardening in Wardian cases is becoming fashionable, aquariums are made to match them in all but the roof, and the water plants are as interesting in their way in the latter as ferns and lycopods are in the former. The only subject we have once more to touch upon is the necessity of a constant supply of fresh water. In out of door works this may be by fountains, or falls, or any other fanciful contrivance. Indoors, it is by a tap with water laid on, or, by drawing off a portion by means of a syphon, and filling up with the common water-pot, or any other vessel ; and the supply must be by river or rain-water, for the water from a well, though much clearer, would be fatal.

ARBOURS.—There are so many ways of forming arbours, and so much depends on the facilities at hand, that we must describe a few, and leave the operator to choose that which best accords with the surrounding circumstances. The most complete are those made over a frame. The most simple are formed with trees brought to meet overhead by tying the branches together. The iron-workers have frames of all sizes worked in wire, and we have only to grow proper climbing subjects to cover them ; but, although it may not be quite so durable, give us wood frames for choice. It is useless to say much about size, because that is arbitrary. If

people want a space large enough to accommodate a tea-party, or a dozen convivial friends in an arbour, they must build accordingly ; but the majority will prefer one that would merely contain seats for three, four, or half-a-dozen ; and there is this distinction between arbours and summer-houses, the arbour has no roof but the branches of trees, the summer-house has a solid roof. The use of a frame for the former is to keep the branches which shelter us from coming down too low, and to restrain the growth of everything within bounds. However pretty an iron or wood frame may be to look at unfurnished, it is the gardener's place to conceal it as soon as possible. A homely but useful kind of frame may be made with long wooden rods stuck in the ground a foot apart for the sides, with cross rods of straight wood tied at two feet from the ground and at five feet, the rods tied across at the top, and a cross-piece fastened where they meet and cross each other ; the spare ends may then be shortened : these may be furnished with *tropeolums*, *convolvulus major*, hops, Virginian creepers, honeysuckles, climbing roses, jasmines, vines, ivy, or with any close-growing trees ; but those subjects which will, after growing, keep in their places are the best, because the old frame may rot and the arbour remain as good as ever. When two trees are close enough together, we may form a good and improving roof by tying them into each other. Yew-trees will make excellent arbours, for they can be cut into any form ; but as these things are merely intended as summer retreats for the sake of the shade, few people care for evergreen coverings ; deciduous trees and plants answer all the purposes, so that there is a great choice of subjects ; but those which make their wood and only have to open each leaf are better than climbers which have to make all their growth from the ground like hops.

SUMMER-HOUSES, GARDEN ARCHITECTURE.—Summer-houses—and winter-houses would be quite as good a name—are roofed to keep out rain, snow, sleet, and hail, and may be of any form that harmonizes with the surrounding scenery, or, if secluded, of any shape we please. Temples are great favourites, and when constructed with taste are highly ornamental. These should be closed on three sides, if open in front, but the open front should face the south-west as near as may be ; and should be entered by a flight of steps. It will then be high, dry, and useful ; and, where the surrounding

plantations are chiefly evergreens, they enable us to enjoy the garden in winter. It would occupy a volume to describe the variety of forms that may be adopted for buildings of this kind. The plantations of each side should be carefully arranged: the main features should be evergreen; the background may be varied with deciduous trees. The evergreens should be diversified, in habit and foliage; the conifers should be conspicuous; for nothing is more graceful, nothing more varied. If there be any portion of the ground more elevated than the rest, that should be the chosen spot; and if not, a mound should be formed, if possible, in the best part of the ground for an extensive, or at least an interesting view; and regard should be had to making the temple a fine object from the mansion. Well imitated ruins are noble ornaments in a garden if properly carried out,—not as we have seen, mimic castles, the size of an old watch-box, but portions of something at least the size of something real. There is no occasion to construct anything very gigantic, but if it be only the remains of an old wall, let it be the proper thickness of an old wall. Nothing is more contemptible than the imitation of a large castle on a small scale; whatever there is standing of the elevation should be as large as would make it useful. It may be impossible to construct ruins on the scale of an old Norman castle, but the remains of an old wall tower would be as interesting, and altogether in keeping. The principal object is to impress the mind with a notion of reality. Perhaps there are few things generally constructed more ugly than ice-houses; yet, as the useful portion is under ground, and the only object is to keep off the sun, there is no good reason why the portion above ground should not be ornamental: we do not mean that there should be a toy-like elevation; but we hardly know a more appropriate object than a ruin. Nothing could be cooler than a mass of brick-work above the ice-well. The architect might indulge his fancy to any extent, so that he provided a doorway, and took care that his general superstructure completely intercepted the heat of the sun. There is no reason why it should not be shaded with trees; while the object, instead of being so ugly that it is necessarily planted out and hidden, might be made an object of interest instead of an ugly brick and thatch hovel. A ruin is not the less effective when secluded; in fact, if more attention were paid to garden architecture, there

need not be an ugly feature in the place : a common tool-house may be made picturesque. Connected with garden architecture may be reckoned all the constructions for preserving plants ; but as these are generally shut off from the landscape, there is rarely anything but the conservatory that forms a feature in the garden ; and here there is often too much display, and that too without harmonizing with anything, not even with the mansion. A pattern is chosen as a man would select a pattern for his carriage, without the least consideration of its fitness for the place it is to occupy. He forgets that his conservatory is stationary, and that it does not accord with his house ; and the builder of the one cares very little how much it is too good for the place. We are no great advocates for the frippery that is too often attached to conservatories. Stained glass windows are great drawbacks to plants ; for it may fairly be said of flowers, in general, that—

“ Beauty, when unadorned, ’s adorned the most.”

Whatever distracts the attention from the plants themselves is detrimental to the general effect. Externally, the conservatory may be what anybody likes best, but internally all should be plain and neat. Conservatories are generally attached to the mansion, and we can hardly imagine a greater luxury than to walk out of the house in the depth of winter into one well furnished with blooming plants : we do not mean a crowded jungle like that at Chiswick *was* and that at Chatsworth *is* (unless it has been altered since the late duke died). We cannot admire a jumble of plants with no interest attached to them but their rarity, but one furnished with attractive subjects to be admired for their beauty. A national botanic garden must have in it much that is instructive without being beautiful, but the conservatory of a mansion ought to be the show-house, as it were, for all the beautiful objects brought forward in the other houses, to be removed when past their beauty to give place for others coming in ; and the skill of the architect will be as much taxed for the finish of the interior as for the elevation.

BRIDGES.—In laying out a landscape garden, and providing the necessary ornaments, few greater blunders are committed than in the construction of bridges, for the architect must generally exhibit his taste in a costly modern erection, where

everything should be rustic. How many splendid examples of landscape are defaced by this palpable error! Nevertheless, we are not to condemn handsome bridges in their proper places, where the bridge can be seen from the mansion, and the mansion from the bridge, and more especially when both can be seen from one spot; the bridge may be, without inconsistency, a noble architectural pile, but the order should match. It does not seem well to have an Italian bridge to an Elizabethan mansion, but we have seen such things, and to us they appear a palpable absurdity. But it should be borne in mind that a rustic bridge, however roughly designed, is never out of place; a man may stick up his English mansion in the midst of rural scenery, but his garden ornaments should be in keeping. If his house be Italian, his bridges must be Italian, or rustic; so, also, if his mansion be Swiss, or Norman, or Grecian, or anything else European, the rustic, whether rough hewn timber or slabs, with limbs of trees for a hand-rail, or more elaborate, cannot be wrong; but what can be worse than a mixture of styles in sight at the same time; a chain bridge, for instance, a Swiss cottage, a thatched hut for a lodge; and yet such things are done; when a bridge is in an isolated situation away from the house, on a little world of its own, make it what you please, but have everything in sight to match, even to the trees and shrubs that you plant. We are partial to rustic bridges, except where all the garden erections match the mansion, and the plantations are made in accordance.

ENTRANCES.—Few features about a gentleman's domain are less attended to than the entrance; we could mention a great many very princely estates, the entrances to which are by no means worthy of the place; all the drive that is in sight is bad—neglected plantations, bad road, the outline of the carriage-way lost or worn out, every yard of the drive bounded by worn-out trees or none, neither rule nor order observed inside the gate, and weeds and waste ground outside. As we approach the mansion things look a little more humanized, but nothing in good keeping till we get to the ground in the immediate vicinity of the house. This is not a very flattering picture of a nobleman's place, but it is quite true of some, and very nearly true of a good many. Whose fault is it? generally the owner's, sometimes the bailiff's, but oftener the gardener's. People roll in and out of their gates in carriages,

and rarely trouble themselves to look one way or the other. But every labouring man out of work, who passes such a place, opens his eyes and sometimes his mouth, and thinks, and says perhaps, "It is a great shame that a rich man should let his place remain in that state, while he could employ men in the neighbouring village to set it all straight, and keep it all creditable." Gentlemen should recollect that a thousand people see the entrance for one that reaches the inside, and that the portion which every passer-by sees is that which stamps the liberality or the parsimony of the owner. We do not quarrel with the gate, whether it be a five-barred one of wood, or an elaborate pair of iron like those at Hampton Court, it is a matter of taste—or want of taste—but the state of the road and trees and shrubs at the entrance, so far as the eye reaches, is a matter of cleanliness or slovenliness, and when neglected impresses the passers-by with a notion that the owner is naturally careless, or poor, or grudges the labourers in his neighbourhood the means of working for their bread. It is this seeming indifference to the appearance of his domain, and to the interests of the poorer classes, that creates an ill-feeling, puts all manner of mischief into their heads, and to a certainty costs the stingy master more in the loss of game, and things not game, than he need spend among them to make them honest and happy, and his place tidy.

GENERAL OBSERVATIONS.—We have shown, we believe, pretty clearly, that without questioning whether formal or landscape gardening is the better, we cannot tolerate a mixture. In landscape gardening there must be no straight lines. Whether it be water, or grass, or roads, or paths, there must be nothing in rows or straight lines; whatever is to be formal or contrary to nature must be isolated, and not make part of the general scene. We have no objections to urge against geometrical figures, and fancy uniform flower beds, but they must be in a garden shut out from the landscape; and indeed, so far do we approve of them in their places, that we think nothing so good in a proper flower garden, of which we have yet to speak, or rather write. The conservatory should, if possible, be so contrived as to be entered from the house, and have its outlet in the flower garden; but we would have neither seen from the landscape. Let private walks, into which the passer-by on the landscape cannot see more than a few feet, lead to the beds of

flowers and fanciful gravel walks. Let there be terraces, statues, vases, and all kinds of garden ornaments, if you will, to be seen when we arrive, but let it burst on our view as we emerge from our branch walk. Let there be circular, oval, square, octagon, or oblong houses; fountains, and fancy flower-pots, all very delightful in their places, but keep them in their places. No mixture can be consistent with good taste; at least, such is the impression which we have, and are likely to keep. We only want things called by their right names. A landscape cannot be a geometrical figure; and for an avowedly artificial garden, order and uniformity can alone be tolerated.

BEAUTY IN SCENERY.—This is touched upon in our directions for laying out ground for landscape gardening, but a few remarks on those features which make up a beautiful scene will lead to a consideration of what should be preserved as well as things to be introduced. Beauty in scenery may be made up of wood only, wood and water, wood, water, hill and dale, and that too without any feature being better than may be found in hundreds of places. Of the latter, one of the finest examples is the view from the top of Richmond Hill. But there are features that could enhance the beauty of that splendid scene. Imagine a clump of rocks from the Trent by the Thames, a rustic watermill in the distance, the ruins of Chepstow Castle in sight! All these would be superb additions to the grandeur of a scene already beautiful. It is in the power of the landscape gardener to introduce all these features in one harmonious scene, and at far less expense than has been incurred in some of our noblemen's domains. The great fault we have to find with many costly places is that the beauties are detached, that there is no regard paid to the whole scenery harmonizing. Chatsworth is a magnificent place, and many of the noble objects are, by themselves, faultless, but Chatsworth is not a whole. We admire the rocks here, the waterfalls there, and the fountains somewhere else; but is there any one comprehensive view like that from Richmond Hill? And let it be borne in mind that the real beauty of that scene does not take in a vast tract of country—the beauty is in its harmony. It is a whole, no matter whose land the eye rambles over, it is all one scene, and might be, for all the spectator knows or can see, all one man's laying out; nor could the addi-

tions we suggest infringe upon the harmony of the view, the objects have only to be properly placed. Now Chatsworth, viewed from an elevation as high as a balloon would carry us, would present a whole; we could see at once the whole estate, but there would be no harmony. Yet what advantages did that comprise? Wood, rock, water, mountain scenery, materials for every feature the eye could covet, as it were, on the spot; yet there is not one point from which a view like the quiet beauty of Richmond Hill could be found. Everything, however, in landscape gardening should be in harmony, and it can always be accomplished if there were all the features that make a scene beautiful. We do not mean that there can be a pagoda here, and a mosque there, or that we are to drag features from all the quarters of the globe; that is not natural, and therefore cannot be beautiful. But we mean that all the best features in natural scenery can be brought together without destroying the harmony. Take a turn the whole length of the Wye—we do not want to have one little island and its immediate dependencies for scenes—and how many times should we stop to admire the mountains and ruins on its banks and within sight? Ramble among the mountains in Scotland and Wales, and how many times should we stop to admire scenes grand and beautiful, because harmonious? What we find beautiful in nature we can imitate in style, if not in magnitude. Hence we say the landscape gardener can make a scene beautiful, because he can bring together in harmony subjects which may not be often found together. But without “stepping from the sublime to the ridiculous,” let us glance at what we may call formal gardening. We have seen this very beautiful; every path, bed, clump, tree, shrub, and plant uniform, straight, circular, angular, and geometrically accurate. The Italian Gardens at Chatsworth are beautiful. The fountains are beautiful; we have no objection to these formal gardens when well kept, but it is beauty of a different kind to natural beauty. When all is architectural in the neighbourhood, and natural scenery is altogether shut out, we can see beauty in geometrical gardens. The American Garden at Cremorne, laid out as it was by Milner, and planted with the most choice rhododendrons and azalias, closed in with canvas, the scene was complete, and unquestionably beautiful. We seemed in another world, or at least in another country. But it is very rare that formal gardening is sufficiently excluded from natural scenery

to be appreciated, and the finest garden that was ever laid out geometrically, suffers by comparison if there be any natural landscape in sight.

FORMAL GARDENING.

This, in contradistinction to landscape gardening, is every way artificial. Every bed, border, clump, or gravel-walk, is formed according to some order or regularity of figure, and all is uniform. It applies to those parts of a garden which are devoted to flowers, be they where they may, and in most places some portion near the mansion, or the conservatory, or the summer-house ; and is thoroughly distinct from the landscape, if there be one : or it may be that the whole of a domain is thus artificially planned—straight avenues of trees, straight roads, straight canals, all are in keeping with each other, and order and regularity, and even uniformity, preserved throughout. The leading features in formal gardening are terraces, statues, fountains, avenues of trees, bold but straight walks and roads, and canals with straight banks ; and circular pieces of water, formal cascades, as if the water were running down a flight of steps,—angles, circles, squares, and straight lines,—proclaim, at every step we take, that the hand of man has done the work. All natural scenery is avoided as much as possible ; and it has been carried so far as to trim the trees up into unnatural shapes, as if it were determined that every plant should bear the stamp of interference.

DESIGN.—We have abundant examples of formal gardening in Hampton Court Gardens and Bushy Park. There is, however, quite as much art in designing a garden, and managing the plan of a domain, in the formal style, as there is in the landscape ; but there is less difficulty in carrying it out. The ordinary architect would succeed in laying down a plan quite as well as the gardener ; and there is no doubt but the builder of a mansion would carry out ideas suited to the elevation as well as any professional designer of garden plans. All things appertaining to the plan must be adopted according to the architectural taste displayed on the building. Terrace-walks should be parallel to the front or sides. Here expanse is exhibited by the length of walks, roads, and avenues ; and these must be upon a scale suited to the elevation of the building. The ornaments to terrace-walks must be in keeping

with the style of architecture. Where there is an immense, long walk, and space on each side, there should be circles every forty, or fifty, or eighty yards, the segments of which, on both sides, should be ornamented with seats, and the centre may be a basin for gold-fish, a fountain, a temple, or some other device, not sufficient to interrupt a view of the entire length, but enough to break the monotony. The planting on either side should be perfectly uniform; whatever shaped bed, whatever kind of tree or shrub, may be placed on one side, should be also placed on the other; and there is no rule for the construction of the edging. In formal gardening, it may be stone, or box, or grass; so that it be uniform, it matters not what. Rock-work, in this kind of gardening, may be as formal as a rough cone or pyramid, so it be in uniform situation. Here it would be as bad taste to see water of irregular shape, as it would to see a straight line in a landscape; therefore, unless a piece of water be of too large a space to see the extent, or observe the figure, it must be altered to round, or oval, or square, or half-circle, or some regular figure corresponding with the scenery adjoining.

GATES.—Walks and roads should lead to some object. The most simple and appropriate, perhaps, is a gate or entrance; and so necessary is this, that we have abundant instances of costly but useless gates at the ends of avenues, which gates are necessary as ornaments, though they may never be opened. But there is a good reason for the adoption of gates—they afford an opportunity of displaying architectural taste; and we may find another good reason in the idea they convey of space. If the gates had a solid brick wall behind them, or were not even made to open, they give one an idea that there is something beyond, whereas a temple appears to be a finish. In Bushy Park, we have a straight road, with a rich avenue of chestnuts on both sides, a circular pond near the end, with what should be a fountain, if it were not out of order, and beyond this the noble gates, which lead out into the road opposite the equally beautiful gates of Hampton Court Palace; and we have straight walks in these gardens, which lead to another gate seldom opened, but they make a finish.

PRINCIPLES OF DESIGN.—It is impossible to set bounds to the fancy in working out figures for beds on each side a walk or road; two or three points must, however, be kept in view. Angles must not be too small: the great fault of many formal

gardens is that figures are attempted on too elaborate a scale; they look well enough in theory, very pretty when empty, because we can see every little turn and corner in the figure; but put plants in only six inches high, and the figure is lost. Let all figures be bold, simple, and easily seen when planted. There is no mistake in a circle, or half-circle, or square, or oblong; but what sense would there be in an octagon?—the straight angles would be lost when the plants grew, or when we were at a little distance. In like manner, any very sharp angle would be lost as soon as plants grew up a little. Whatever, therefore, be the design, some care must be taken to use no figure that could not be seen to advantage, and always to adapt it to the height of the plants to be grown there. The road up to the entrance of a mansion should be the segment of a circle, for the sake of convenience; or the entire road from the entrance might be a whole circle: but the back-front of the house is the place to display taste in the terrace-walk. The garden at the back may have an entire walk of four straight sides going completely about the space, or at least so nearly as brings us within sight of the boundaries; or there may be a square space enclosed, as it were, by four straight walks; or the entire space may be compressed by a terrace-walk the whole width parallel with the back-front, and other walks uniformly diverging to the extent of length, with avenues of trees or shrubs, and terminating with some object; and in these avenues there may be statues, fountains, sundials, or whatever other device may please the taste. There should, however, be grass or flower borders, or both, on each side these walks, planned uniformly and planted uniformly. There can be no set rules for the laying out of a formal garden, but there are some points worth considering. If, for instance, we have an avenue of trees in a garden, it would be most desirable if we could make an opening through all the wood in the adjoining premises, because then the effect would be so much more grand.

Whenever a walk is very long, there should be breaks where seats could be placed. If we have to put a gate at the end of a walk, to give an idea of space, let the walk terminate twenty yards before we reach the end of the grounds, and let a cross-walk appear on the other side of the gate; or, if it be preferred, let all beyond the gate be lawn or grass, and planting conceal the boundary, whether it be palings or wall.

BOUNDARY WALLS.—In formal gardening there is frequently used what is called a ha-ha fence, the object of which is to prevent a view from being interrupted by a wall or common fence ; this is made by digging a trench five or six feet deep, and building a wall up to the surface only, and outside the wall the earth is removed altogether in a sloping direction ; so that on the outside any one may walk down the slope to the foot of the wall, and there he is as far off getting in as he would be if the wall were on the surface, and as much above him. By means of this ha-ha fence we are enabled to appropriate the land beyond the fence to cattle, or to any other purpose, without having the space confined, or the view interrupted, by a wall above the surface.

In planting these formal gardens, the greatest care must be taken to plant such trees and shrubs as are adapted to keep up a uniform growth ; because, unlike the landscape, where the difference of growth and foliage, however uncouth that growth may be, in some cases rather heightens the natural beauties of wood, the formal garden wants uniform growth—a mixture of wood, unless it be a uniform mixture, would destroy the harmony and keeping of the place ; a clump of shrubs on one side must be opposed by a like clump on the other ; rhododendrons should not only be put opposite rhododendrons, but the like kind of rhododendrons ; and in the management of these uniform clumps the knife must restrain the too vigorous growth of any that, by exuberant shoots, bid fair to spoil the uniformity. After things have attained a tolerable size, and got well hold of the ground, these will not vary much. The clumps of flowers, or rather the flower-beds, must not only be uniform, but they must be furnished in a uniform manner. If there be a round bed on each side, they must be filled with flowers of the same kind and colour. Nine-tenths of the geometrical gardens are spoiled in the planting ; for, even in the instructions which some flower gardeners have published, there is a direction what to grow in each compartment, without the slightest attention to uniformity of colour ; and we have recently been through a garden where the beds are uniform and not even the colours alike. This borders upon downright ignorance of principle, because if we desire uniformity—which we show we do by making the beds uniform—it should be carried out by planting the same things in all corresponding beds. If, for in-

stance, we have a round bed on each side of a path, and all other things are in uniform order, what sense is there in putting a patch of blue flowers on one side and white on the other?

In planning geometrical gardens, the compasses will do all we want, but in uniform gardens we may make all sorts of strange figures. We have seen ideas taken for patterns by first doubling a piece of writing paper, then with a pen scribble any kind of figure on one half the paper, and when it is wet close the other half on it—the figure will be doubled, and of course must be perfectly uniform. This is a very simple thing, but well worth the attention of everybody who has to do with uniform patterns. But formal gardening is not confined to great places; there is scarcely a suburb of a town in England but contains houses with gardens on too small a scale to be anything but uniform. A square space in front, with a half-circle for a carriage sweep, is the proper description of thousands of villa gardens.

FLORISTS' GARDENS.—But formal gardens especially belong to the whole race of florists, that is to say, the cultivators of florists' flowers; and as this concerns thousands, we will take from the first the laying out of a florist's garden, and the gardening required to keep up a good stock of florists' flowers, for there is not anything in the whole routine of gardening that requires more care, or that, until very recently, was so little understood. Formal gardening especially applies to the cultivation of those subjects which have been improved on, those breeds which are grown in collection under name. And first let us look to the requirement of the florist. He must grow everything in beds or pots. Every individual plant has its name, and is known when in flower, to the true florist as well as a man would be. Most of these favourites are cultivated in beds. Pinks, pansies, tulips, ranunculuses, anemones, verbenas, and many others, are uniformly cultivated in beds four feet wide. A true florist's garden, therefore, is best laid out in beds right and left of a centre walk; and if he wishes to be neat, he will have two-feet wide paths between, so that he can turn right and left anywhere, and work among his favourites without treading on borders. The centre walk ought to be six feet wide, and the beds, which should be laid out at right angles on both sides, must be four, the paths between, eighteen inches at the least, but two feet if the ground

can be spared. The length of the beds should be about twenty-five to thirty feet in the clear. Now, as four feet on the path end of the bed should be devoted to the path, that is to say, to plants which should form a border of flowers on each side, although in reality intersected by the narrow side-paths, they would require to be four feet longer on that account, but the length is necessarily governed by space. It may be that there is not enough ground to make such length of beds, therefore the length we have mentioned has reference rather to large than small gardens; for we follow up the subject by mentioning, that if the width of the ground is considerably greater than will make such beds as we mention, we would have other paths parallel with the middle one, so as to make two beds in width on each side instead of one. Suppose the ground to be anything under eighty feet wide, we would have a three-foot wide path down each side, within three feet of the boundary, so as to form a three-foot wide border all round the garden; then a centre walk of four to six feet, and paths of eighteen inches two feet right and left, so as to lay the whole out into four-foot beds, the length which the ground would allow. For instance, if the ground be eighty feet wide, the six feet for the middle path, the six feet for the borders, and the eight feet for the two four-foot side-paths would occupy twenty feet of the width, and leave all the beds thirty feet long; and by occupying the four, or say five feet, with plants, to give effect to both sides of the centre path, twenty-five feet length of bed would be left for florists' flowers.

If the ground were considerably less than this, the beds would be proportionably shorter, and one would feel inclined to lessen the width of the paths to make the most of the ground. In these beds most of the subjects would be planted six inches apart, and therefore seven rows in a bed taken lengthways—although florists count the rows the other way always, and say so many rows, seven in a row. This is the most compact width for all kinds of operations. We can reach two feet across without inconvenience, to weed, plant, prune, or do anything else to whatever the bed contains. These beds are equally convenient for all things, even dahlias and hollyhocks, the two largest and most unwieldy things we have to do with, would be at proper distances one row down each bed, or of hollyhocks perhaps two rows, as they do not spread so much. But the very formality of the florist's

garden, which should be neatness itself, should be kept up in the planting. A pink-bed on one side the path should not be opposed by a pansy-bed on the other ; nothing would look worse, although we have often observed the florist to be too much taken up with the flowers, individually, to look at his garden as a whole, and therefore in too many instances he is neat only in the beds which occupy his attention for the time being. His pinks, pansies, tulips, and other flowers occupying the beds, may be neat and clean, but the beds unoccupied with flowers are too often neglected and overrun with weeds, whereas they should be the cleanest part of the garden, on account of their being empty and having nothing to set them off. A space must be cut off, and put, as it were, out of sight, by planting, or by some other means ; for the florist must have his heaps of composts and manures, his shades, glasses, and pots somewhere out of sight. All the formality and uniformity in the world will not serve him, unless he can put what may be fairly called his rubbish out of sight.

We would now instal the florist in his ample garden, formal though it be, with a tolerable collection of all the principal florists' flowers ; and as there are hundreds of professional gardeners who do not know how to cultivate florists' flowers, and thousands who desire to know more than they do, we cannot do better than follow up our formal gardening with some instructions upon that most formal of all gardening, the cultivation of florists' flowers ; and we begin by answering the question of what are florists' flowers ?

FLOWERS AND PLANTS.

FLORISTS' FLOWERS are those which have by high culture and careful seeding yielded new varieties of better character than they were originally produced from, and which have been multiplied when improved, whereby any distinct variety has been perpetuated under a name. Flowers of which the raisers of new and better varieties have thrown away the worst until they have approached a high standard. Flowers which are constantly improved upon and abandoned for the better, until they have strayed entirely away from their original form and character, and can be distinguished by name, and recognised by the florist, in any part of the world, though in some cases there are many hundred varieties. Therefore it follows, that

a florist's flower must be a perennial, and capable of multiplication by some one or more of the ordinary means of propagation, or by their own spontaneous efforts. For many years the florists' of England, and perhaps of the whole world, prized novelty without having any standard by which they could prize other excellence. Hence a new thing, whether better or worse than was possessed already, was coveted by all who pretended to collect and cultivate collections, and bore a large price, although soon thrown aside to make room for better. Of later years, there were writers who professed to give the criterions of excellence, but as these were founded on no principle, floriculture, as it was called, progressed slowly. A man might, among a thousand seedlings, see many variations; but as the criterion of perfection, so called, was not well defined, but on the contrary, was calculated to puzzle him still more, the selection of those remarkable for some change in the colour, instead of those with good properties, made the progress towards excellence very slow. At length, however, a standard was laid down which, although perfectly ideal, was founded on principles which everybody could understand; and admitting the fact that it was almost impossible to realize this standard, the floral world at once saw and understood what to aim at in their selection, and the science rapidly advanced.

The principal florists' flowers for many years were the tulip, the hyacinth, the ranunculus, the anemone, the auricula, the polyanthus, the pink and carnation. But we have seen added the geranium, the rose, the verbena, the dahlia, the hollyhock, the cineraria, the fuchsia, the calcolaria, the picotee, the pansy, and many others; for whatever is capable of improvement, and is once taken in hand by florists, has been and will continue to be improved by enthusiasts who are content to grow thousands for the chance of getting one really good novelty.

ANNUALS.—These are plants which come from seed, grow and bloom, perfect their seed, and die the same season; they are great favourites, because they are very soon in flower, and they are esteemed in proportion to the time their beauty lasts, some of them are in perfection but a short time, others continue blooming for a long time, because they continue growing and each shoot brings its bloom—as examples of the former we may mention the larkspur, and of the latter, the French

marigold, the one is grand for a week, but the seed-pods swell directly, and as soon as they are ripe the plants die ; the other grows and blooms more and more profusely the longer the cold weather keeps off, and is generally covered with flowers when the frost cuts it off. If some of these so called annuals were treated as perennials, there is no doubt they might be perpetuated. Small cuttings struck towards the end of autumn would go through the winter, and flower early in spring. Stocks we know will do this, and balsams we have so treated many times, but as no object is to be gained by it, the thing is not worth the trouble. The distinction between hardy and tender annuals is not strictly correct, for some of the so called hardy are cut off by the first frost, and, strictly speaking, a thing cannot be hardy that will not bear our climate. In many cases it only means that they are able to perfect their blooms in our short summers, or at least to make a great show in a short time. For instance, the nasturtium is catalogued as a hardy annual, because you may sow it, and it soon comes into full bloom ; but there is not a more tender thing grown, the very first frost cuts it off while in full growth and flower ; however, the terms hardy and half-hardy, as well as tender, are pretty well understood. Our summers are long enough to bring the first into bloom, and even the second, whatever may become of them afterwards, and the third are sown under glass, early enough to be forwarded a month or six weeks, so that they may be planted out as soon as the winter and spring frosts are gone, and begin their out-of-door life when six weeks or two months old. The half-hardy and tender annuals may be sown in slight hot beds, or within the greenhouse, or stove, and as soon as they are large enough, prick them out round the edges of pots, keep them near the light, and the greenhouse, or a cold frame is the right place for them till the middle of May, when they may be planted out where they are to bloom. There are some very tender, requiring hot-bed or stove culture all through the summer—such as cocks-combs, these can hardly have too much heat, light, moisture, and air. The only way we can prevent them from drawing up too much, is to place them as near the glass as possible, and give them air as they advance. The best of all means for such things is the common dung-bed, for they can be placed close to the light, and air can be given liberally on warm days, and sufficiently for their health on most days by tilting the glass.

BIENNIALS AND PERENNIALS.

BIENNIALS, generally speaking, are sown one summer, and bloom and die the next, as soon as they have ripened their seeds. Most of them are hardy enough to stand our winters, for one summer is not long enough to complete their growth, even with the help of the hothouse, greenhouse, or frame. Many stocks are biennial. The Canterbury bell is a biennial; and if sown about June, planted out when large enough, will flower about the same time next year. Perennials are plants which do not die at any given period, but would live on, like an oak or vine, if the necessary conditions could be supplied; and the great family of plants comprises most of this kind.

HARDY PERENNIALS will grow many years on the same spot and spread into large masses. Bulbs increase in number. Fibrous and tuberous rooted subjects spread out into many plants all round, and only want to be separated from the parent. Many of them separate themselves, and when they degenerate it is from remaining too long on the same spot of soil, which they in time exhaust.

STOVE PERENNIALS, cultivated in pots, are from time to time shifted from one sized pot to another, and new soil is filled up all round the old ball of earth, and the plant continues to grow so long as this can be done. Bulbs, such as amarylles, propagate themselves. Corms, such as gloxineas, gesneras, &c., do not multiply much by the roots, but strike freely from cuttings, as will all fibrous rooted plants. Tuberous rooted subjects, like many of the iris tribe, can be raised from bits of the tuber with shoots to them, but the old plants will live as long as we give them good pot room. The bulbs and corms, when the bloom is over and the seeds are ripe, want rest, and it is only necessary, when the stems or leaves die down, to leave off watering until they start again; they may then be cleared of the old soil, repotted, and grown on as before. Achimenes, which has become a large family, comprising many varieties, multiply very fast by their tuberous roots; and when they have died down and rested about six weeks, the ball of earth may be broken, and the tubers carefully sorted,—the largest potted again, two, three, or more in a pot, an inch below the surface, and be set to work and watered. To raise the plants of various sorts from cuttings,

new shoots may be taken—when they are an inch, or from that to two inches long—close to their base, and be placed in bottom heat, in the shade, or be artificially shaded with paper; and the most convenient way is to cover them with a bell-glass that may touch the soil all round, to shut out the air and draughts, and lay paper over them to form the shade. In this case, the soil must be kept moist, and the glasses wiped dry every morning, and occasionally, on dull days they may be left off for an hour. In our own place we have a table or shelf at the lowest part of the roof, with a hot water tank under it, and we place the cutting-pots and pans on it, throw a mat on that part of the roof, and use no glasses at all; they strike as freely as they would with the greatest pains. The mass is only put in while the sun is out, and the cuttings have the benefit of full daylight both before the sun is up and after it has set. Most things root in a few days, and we use the same means all the winter to strike all our greenhouse and frame cuttings, and afterwards gradually inure them to a cooler climate. When cuttings are rooted they should be potted single into small pots, and as they are filled with roots change them to larger ones. This operation has to be repeated as long as we desire the growth to continue, for even the largest specimens must be shifted into larger pots so long as we desire to grow them in health and strength. The only rule for this is the filling of the present pots with roots; and if they happen to be near blooming, so that it would be unwise to disturb them for a time, give them a watering with liquid manure, made by dissolving a spadeful of rotten manure in about six gallons of water, well stirred three or four times during two days, and use the clear water after settling. This will give a fresh impetus to the soil already there, and let them bear the shift afterwards.

GREENHOUSE PERENNIALS only differ from those of the stove in the temperature they require. The same modes of propagating will answer in both cases, but in the greenhouse we have many plants that are propagated by grafting, such as camellias, corraëas, and the like. The single or worthless sorts being more robust, form excellent stocks on which to graft the better and weaker sorts, which derive far more nourishment from the strong stock than they would from their own roots if struck as cuttings. The reason is this,—the stock may be two years old in strong growth, and any

graft put on this has all the vigour of a two years' old root, because the stock is cut down, and all the strength that would go into the two years' old plant cut off is thrown into the graft just put on ; this, of course, promotes stronger growth. In consequence of this advantage, many subjects are grafted on the strongest-growing species of the same genus, or one nearly allied to it, as the quickest mode of propagation. But all the other modes of propagation are occasionally adopted, and especially by cuttings, which are the least troublesome and most effective when a plant will strike root readily. Propagating from seed is often resorted to for the sake of obtaining new varieties, and the seed may always be sown as soon as it is ripe, but it is frequently kept back till the spring, that the young plants may have less hardship to go through than they would if nursed in a young state through the winter. Half-hardy, or frame plants, want just the same treatment ; and most greenhouse plants would do as well in pits, which are for the most part mere substitutes for greenhouses, and only differ in not having hot-water pipes. Yet, when they are covered up well, the frost rarely enters them. They are used for azaleas, camellias, and other robust but not quite hardy things. If the seeds of greenhouse plants are raised, or the cuttings struck, in the stove or propagating house, they should be brought into their own house as soon as possible ; for heat, although it may promote growth, certainly does also induce weakness, so that they should be gradually brought into the greenhouse as soon as they are large enough to bear the change.

Many plants may be carried over from one season to another by cuttings struck from time to time ; even mignonette can be kept growing, but it is hardly fair to call anything a perennial that will not stand from season to season without propagation. The Canterbury-bell is a true biennial, for it must be sown one summer and bloom the next, and when the seed ripens it dies. The Sweetwilliam and wallflower are treated by most people as biennials, but the cuttings of both will root and do well, and it is the only way the double ones can be obtained.

BULBS.

It is much to be regretted, we think, that more attention is not paid to this extensive and varied family in gardens of

great capacity. It is true that millions are imported and grown because there are millions of people to grow them ; and all have a few of some kind if they have a garden, or even a place for flower-pots or glasses ; but considering that a vast number of the best are perfectly hardy, and will continue from year to year growing, if undisturbed, in our English climate, they ought to be grown in large collections in all good establishments.

THE HARDY BULBS comprise many families : the snow-drop, crocus, hyacinth, tulip, narcissus, lily, fritillaria, crown imperial, give us thousands of varieties of form, size, colour, and habit, and might be left in the ground to grow wild, but, if cultivated with care, form a magnificent border of flowers for several months in the year.

The snowdrop and crocus may be planted three inches deep, and be taken up every third year.

The lily, fritillaria, and crown imperial may be planted in the same way, and taken up every second year, and replanted as soon as convenient after dressing the ground, because scaly bulbs do not like to get dry.

TULIPS may be mentioned by themselves ; for, independently of the great diversity of colour, they bloom at different seasons : some as early as March or late in February, and others come in succession until the end of May, and half-way through June. Plant three inches deep, and take up yearly.

HYACINTHS form a glorious family to grow in pots, glasses, or the open ground, giving every variety of shade and colour, and being calculated for the house as well as the garden. These are to be planted three inches deep, and taken up when the leaves turn yellow. If potted, they must be covered an inch, and if glassed, they are to be put in the ground as soon as the flower fades, and left there till the leaves fade also. The narcissus only wants planting like a tulip, and taking up when the foliage dies down.

Bulbs, while out of the ground, must be kept dry and cool, and not be frosted.

STOVE BULBS in cultivation in this country are not very numerous. By far the most interesting is the amaryllis, of which there are many species and varieties. The only difference in their culture is the heat they require. They may take their place among other stove plants, and when the

leaves turn yellow, they want no more water till they start again.

GREENHOUSE BULBS are not very numerous. Crinums, paneratiums, some of the lilies, ixias, sparaxis, and their congeners, will not bear our winter out of doors, and therefore are called greenhouse bulbs, but there is nothing particular required in their cultivation.

All bulbs will do well in loam, leaf-mould, dung from an old hotbed, and peat earth in equal quantities; and if nothing else tempted those who can afford to cultivate bulbs extensively, the little trouble attending their growth and their increase, without the least care or labour, ought to insure for them a much more extensive patronage.

CLIMBING PLANTS.—Of these there are many species, and whether they are stove, greenhouse, or hardy, they only want the same treatment as other stove, greenhouse, or hardy plants, with the exception of the training; the honeysuckle, the jasmine, Virginian creeper, passion-flower, and any other hardy subject that grows up a pole, or on a wall, or over a verandah, or on the front of a house, should be constantly fastened as it grows, for if it once get into disorder by the neglect of the cultivator, it is difficult, if not impossible, to get it as perfect as if it had been fastened as it grew. In conservatories, and houses where it is planted on the border, the same care must be taken to “train it up,” like a child, “the way it should go.” But when climbing plants are grown in pots, they want some more careful management than plants in beds and borders. They are very difficult to shift when they get large, but shifted they must be when they get pot-bound. The kind of support to be given is varied according to taste. Some have iron trellises, some large branches of trees—a very effective plan—cut into the form of a fine-grown beech; some are made to fill a large flat shield of iron-wire; others have wooden stakes put all round the edge of the pot, and wind the plant round close as it grows; but in all these cases there must be no neglect in fastening the plants as they grow, or they will get tangled, confused, and, in the effort to set them right, materially damaged.

ROOM-PLANTS.—There are no plants, or class of plants, that go by this name, but what is understood by the term is, plants that will grow in a room. Now, all greenhouse-plants will do so in summer-time, as will also all hardy plants that will

grow in a pot. The directions for the culture of hardy and greenhouse plants should be followed as nearly as possible. In the dwelling-house we cannot give so much air, nor can we give a damp atmosphere. The next to this in efficacy is, to water the plants overhead in the evening, and shade them from the morning sun. The geranium appears to be the best of all plants adapted for a house, for we have known one to live and do well for more than ten years, and cover a window with its branches and leaves. The old oak-leaf, the horseshoe, and a dozen others of the old sorts, celebrated for the peculiarity of their foliage, and the scent of it, seem quite at home in a dwelling-house, if they are regularly attended to. But the show pelargoniums are so much gayer, that people are no longer satisfied with their old friends. The new ones are not, however, so permanent in their bloom, nor so free in their growth. The scarlet geraniums are nearly all calculated for house culture. The air of a room is too dry for the fuchsia. The blooms often fall off. Again, no plant will stand the fumes of gas, and many a plant has disappointed the purchaser on that account alone. If the temperature of a room be pretty even, and there is no fire lighted, the camellia japonica may do pretty well. Acacias generally will do; but heaths, the Botany Bay varieties, ought to do well in almost any room without fire. Many of them are nearly hardy; that is to say, they will bear several degrees of frost; but the sun must not reach them to thaw them rapidly. We are now writing of dwelling-houses in the country. In manufacturing towns, there is more difficulty. But the scarlet geranium, and all the old-fashioned sorts, will do almost anywhere; and bulbs may be made to keep up a succession of flowers, from the time the snowdrop begins in January, right through February, March, April, and May; for if the roots are sound when purchased, and are potted in good stuff, or glassed with good river water—but the most convenient for glassing are hyacinths and narcissus; and by beginning to pot in September or October, and keeping them down in the cold cellar, you may bring up the first half-dozen in a month, and the next half-dozen in two months, you will have a succession of flowers even with the same sorts. Every plant that will thrive in a greenhouse may be taken to the dwelling-house before blooming, be allowed to flower there, and then be brought back again, without suffering more than it will recover when put back again.

SEEDLINGS, SEED SAVING, AND PRUNING.—All new varieties must be had from the seed. You may propagate for ever from the old plant of anything, and the young ones will be like the old one ; but if we propagate from seed we may find among the seedlings something new. It is thus that we have improved races—it was by these means that all the improvements in fruit, flowers, plants, and vegetables have been made. In our notice of hybridizing we have given a good idea of what has been and can be done by cross breeding. We cannot alter the character of seed once saved, but we can direct the course it will take a little while we are saving it. For instance, we can put some of the very best of the sorts of plants together, save the seed from them, and thus do something towards insuring good, and some may be new varieties ; but some plants sport so much, that perhaps out of the seed from a white dahlia we may get all colours *but* white, and there are other flowers as much inclined to roam. In any attempt then to save seed for the improvement of the flower, or vegetable, or fruit, select the very best that you can procure, half a dozen sorts if you can, place them together, and there is a chance of their impregnating one another, and giving some crop for the better as well as for the worse. When any subject is seeding, watch that you may gather it when ripe, or you may lose it by the bursting of the pods. When seed has well ripened, it only requires to be kept dry and from the air. If it once get damp, or be put away before it is thoroughly dry, mildew and death are sure to follow. If you send it abroad, it should be sealed up in bottles soldered in tin canisters, for seed will last many years when kept from the air.

BEAUTY IN PLANTS AND FLOWERS.—Beauty is not very easily defined, for it may be seen in every tribe of plants, and nearly every family of flowers. Whatever has too many or too few leaves cannot be beautiful as a whole, but its flowers may be all that can be desired ; on the other hand, a plant may be very splendid in habit, have very little flower, and that little ugly. A plant to be beautiful must have a fine proportion of bloom, graceful foliage, and be of graceful form ; generally speaking the public is a good judge in the long run of what is beautiful ; witness the plants which are favourites among the middle and even humble classes, as well as among plantsmen. The camellia, the geranium, fuchsia, calceolaria,

cineraria, auricula, polyanthus, azalea, rhododendron, rose, pink, carnation, dahlia, hollyhock, balsam, and a score other popular subjects. What can supersede them? They all possess great properties, but there are ugly plants and flowers of all these, that is to say, ugly by comparison. Place a single rose, pink, dahlia, hollyhock, or balsam by the side of double ones, and though we are told there is nothing ugly in nature, we should dispute the point. There is, we are free to admit, much to admire in the most simple weed, but by comparison with improved varieties, even of the same weed, they are ugly. In our volume of "The Properties of Flowers" we have given thirty standards of perfection for as many flowers and plants; of course our own notions of beauty are given there for the objects stated, and they are all stamped with the public approval long since; but a coarse and vulgar taste has sprung up through the encouragement given by the Horticultural Society to coarse, vulgar, and unnatural growth, necessarily supported by hundreds of sticks, and by the employment of people of coarse minds, who, instead of disqualifying things unnaturally supported and trained, gave them prizes without remonstrance or objection. We cannot call a geranium with two hundred sticks to hold up the blooms beautiful, although there may be a glare of flowers. We cannot call a rose which is bent down, curled round, and turned up again, beautiful. The torturing of the branches of a rose to make it go into the compass of a dwarf after the fashion of Paul, is absolutely discreditable to the gardener who stoops to such means, the judges who award prizes to such things, and the society that permits it. It may be said that the effect is as good at a distance as if the plants were honestly grown. If so, pay such botchers for the use of their sham dwarf roses, and let them be distant decorations, while creditably grown plants, which exhibit real merit, compete for the prizes. If there must be great plants sustained by so many miniature scaffold-poles, let them be hired, and let objects really natural and beautiful compete for the prizes. It is hard in the face of this perverted taste, but we have a right, nevertheless, to point out objects that we think beautiful in contradistinction to the stage monsters at horticultural shows. A rose bush grown naturally without support, able to sustain its flowers in their places, and clean and healthy in the foliage, would be beautiful if it were not eighteen inches

high. An azalea like Lane's grown as a standard, well bloomed and of graceful form, without any sticks and ties to hold the branches in their places, is a beautiful object, while the monster beehive-looking plants, whose branches are curled and twisted down and up again, to bring its flowers to the surface of a cage, is comparatively ugly with all its flowers, because it is unnatural. The plants usually exhibited at shows would, if grown of their natural form, be very beautiful, because the distinct habit of every plant would be seen, and the many varieties of foliage appreciated; but shown as they are, merely monstrous cones of flower, not a branch nor a twig left at liberty; broad and narrow foliage, tall pyramidal species and trailers, all tortured into one shape, are very disgusting. The only chance we have now of seeing stove and greenhouse plants in their natural form is at those private collections which are not intended for public shows, and are therefore growing undisturbed, developing their natural habits, exhibiting their different foliages, and opening their varied flowers unconstrained, and this is a beautiful sight. In a general way a plant is not considered beautiful unless it shows an abundance of flowers evenly disposed over the surface of green; graceful compact habit, whether bushy, pyramidal, or standard; colours of flowers not necessarily brilliant, but dense; blooms large in proportion to the plant, or in racemes, trusses, umbels, or bunches, to form a sufficiently large feature; foliage shining like a camellia, dense like a rose, or velvety like a gesnera. These are qualities indispensable to make a plant beautiful. Nevertheless, there are plants with ugly foliage and beautiful flowers, like the cactus; and there are others the reverse, like the endless variegated species which fashion tolerates, and horticultural societies have rendered popular by giving prizes. The very best of these can only be called interesting. As to florists' flowers we can have no difficulty in pronouncing on their beauty. But many of these have insignificant plants; witness the carnation and picotee, some of whose flowers are beautiful beyond all praise, while the plant is a mere tuft of grass, and a long gawky stem unable to support itself. But many of the florists' plants, such as the fuchsia, cineraria, calecolaria, and geranium, are beautiful objects when properly and naturally grown. In our time there have been some thousands of new plants introduced described as beautiful. The strongest

proof that they were not so is found in the decision of the public, for that many-headed gentleman is never wrong long together, and if a plant be good it is never lost sight of. A really beautiful subject never fails to become popular.

SPECIMEN PLANTS.

THE perfection of gardening is to produce plants grown in the way best calculated to set off their natural beauties ; and perhaps there is nothing upon which the gardener is more likely to fall into error than in the form of his specimens. We are justified in this opinion by the unnatural way in which plants are shown at the exhibitions. Man is an imitative animal ; and, because one shows a great mass of bloom, and is lucky enough to obtain the distinction of a prize, which, it is universally admitted, is too frequently awarded to novelty, all the others follow in his wake, and try to outdo him in that feature which in their eyes obtained him the prize. But we do hope the thirst for artificially grown plants is passing away ; that there may be some grace and elegance studied where mechanism now reigns, and that, instead of the formality and stiffness which characterize our public shows, we may see an approach to nature. Thus, instead of having climbing plants covering a balloon-shaped wire-work, or a flat shield, or a formal pyramid, or a cone, we may see them trained on something like the skeleton of a tree. It is quite certain that a branch of a tree, trimmed into the form of a good shrub, makes the most elegant and effective trellis, if it must be called so, for the support of a climbing plant ; and, if wire-work is to take the place of this, let it be in some such form. We have often expressed our disgust at the manner in which geraniums are exhibited ; they are drawn so that they cannot even support their own flowers, every stem is tied to a stick, and sticks are put in all over the pot pointed outwards to spread the flowers mechanically over a head that looks artificial, and to the utter destruction of every appearance of a plant. We see nothing so like it as artificial flowers stuck all over a large cushion to show them off for sale. We see roses shown in pots with stakes standing on a slope all round like the wires of an umbrella, and the plants tortured to show their flowers at particular distances ; plants drawn so that they could not sustain the weight of

their own blooms without these supports, than which nothing can be more displeasing to a person of any taste. Stove and greenhouse plants, pent up in wire cages, and their shoots drawn through the wires that their blooms may be exhibited on the surface ; in fact, the most graceful and elegant natural objects, are tortured into lumps which bear no affinity to the proper habit of the plant ; and judges, which for such displays might be as well chosen from the class of milliners, haberdashers, and artificial florists, actually recognise a seeming propriety in this perversion of gardening, and give premiums, as it were, to encourage unnatural cultivation. We earnestly beseech gardeners of independent principles and sufficient skill, to repudiate all this monstrosity, to grow their plants naturally, and exhibit some taste as well as talent ; for they may rest assured that in the long run the public will recognise the beauty of nature, and the knowledge and taste of the gardener, beyond the cunning of the mechanic and the trickery of second-rate cultivation. It must be plain to persons who take the trouble to think, that no deficiency of skill ought to be hidden or aided by mechanical contrivance ; the man who cannot grow a rose in a pot without supporters is deficient in his business ; the plant that wants no assistance out of doors ought to have none under glass ; we do not mean that a main stem may not be supported, because the root cannot spread out beyond the edge of the pot, and therefore cannot have the power of resistance which it would in the open ground ; but when the plant is drawn, and the branches are too weak to hold themselves up in their places, there is bungling somewhere.

If we were to individualize plants that are discreditably shown, because artificially supported, we might mention one that is as robust as a box-tree, and yet there are specimens exhibited that ought to make the exhibitor ashamed of himself—we mean *Eriostemon buxifolius*, a hard-wooded, elegant, pyramidally growing plant, as handsome as a fir, capable of sustaining itself if well grown up to any height and size ; yet even this is, by some highly lauded and lavishly rewarded gardeners, shown with all manner of supports, and propped and wired into a form as unnatural and ungraceful as can well be imagined. And we are sorry to say that, whether it be the employer's taste or the gardener's, there are many other plants equally distorted and spoiled among the collections, that take

off, as it were by prescription, the first prizes. In short, our exhibitions now, particularly near the metropolis, have every appearance of an assembly of artificial plants instead of real ones. If a man exhibits the *Oncidium Papilio*, the perfection of which is in its moving on its long wiry stem with every breath of air, as if it were a real fly hovering over the other flowers, you will see it pinned to a tall stick, perhaps with a bunch of cotton lint behind it, and as stiff as if the butterfly were pinned to the stick; they have not the common sense to release it from its bondage; but we suppose, by its freedom, it would form too great a contrast to the stiff and formal specimens composing the rest of the group. We regret this perverted taste, or want of taste, because it is derogatory, if not downright disgraceful to British gardening. Profuse bloom, and every flower dragged to the surface, seem to be the chief objects now; and the great mistake is, that when the bloom is disproportionably great it is as much a fault as being deficient. Then again, in blooming a plant profusely, the bloom and the foliage must take their proper places, but if the appearance of profuse bloom is to be given to a thing, by dragging every flower to the outer surface and tying it to the wires of a cage, we should like to see judges employed who know their business, and the exhibitor of such abominations disqualified.

We do not quarrel with trifles—we are not so squeamish about a bit of bass-matting or a prop as to cavil with it, but let any gardener who is not a prize hunter upon any terms that will get them—any man who loves his profession, and is master of it, examine the plants at the Regent's Park, or at Chiswick, and count the props, wires, and ties, and ask himself whether he would condescend to degrade gardening by adopting such means to win all that could be got by it? We are quite aware this is an unpopular subject. Propriety has no chance against bad habits, and taste is but a poor opponent to gold medals; unless the societies or the judges correct the evil, there is no extravagance or trickery, no depth of degradation, that would not be resorted to by regular prize hunters. It is only the withholding of the prizes for unnatural training, as Mr. Loddiges did in 1833 or 4, when he was acting as a judge at Lord's Cricket-ground, that will bring gardeners back to sound taste and natural cultivation.

It has been long observed that geraniums are propped in a

most discreditable manner, and some of the publications of the day have at length joined in the complaint ; but although geraniums are, from their habit, more conspicuous under their torture, other plants are, in many cases, as much deteriorated, and by similar, or worse means. It is, as we have before observed, the perfection of gardening to produce finely grown specimens of plants in their most elegant and graceful habit ; but it is a prostitution of the science to produce them as too many are shown at our metropolitan exhibitions, and we hope those who happen to be judges will, out of pure regard to the skill of the gardener who can grow specimens naturally, reject at once all those collections in which plants are unnaturally trained. If the gardeners will not of themselves cure the evil, the owners ought to interfere, unless they wish to be identified with such ungardener-like practices. How would it read in a report of a show—First Prize for collections, Mr. A. B., or Mr. C. D., with *Eriostemon buxifolius* on a frame, with forty yards of iron wire and eighty-one props, the plant being too weak to stand without them? *Pimelia decussata*, with seventy-six props and ninety ties, and so on through the list of plants, showing that a prize had been awarded to a collection of plants that, without these props and wire-work, dared not have been shown at all? It is quite time to interfere with this matter before British gardening is utterly disgraced. It is quite time the owners forbade it for the sake of their own taste : it is quite time the judges and societies repudiated it for the sake of the interests of Horticulture and Floriculture, which they profess, and are bound to encourage. Half the gardeners who grow these drawn up plants are incapable of growing them properly ; some of those who grow geraniums, others who grow roses, and still more who grow general collections, would, if they were forbidden to use these unnatural auxiliaries, be at the bottom instead of the top of the prize lists. Young and skilful gardeners, who have never degraded their own scientific acquirements by condescending to such tricks, would beat them until they learned their business, for they have to learn it before they earn reward.

The growing of specimen plants requires first that we should study the habit of the subject, and to aid in producing it in the best possible style. If a plant is naturally of pyramidal growth, it needs little else than rubbing off the buds wherever they are going to shoot and are not wanted, to throw the

vigour of the plant into branches that are necessary. The repotting from time to time as the old pot fills with roots, to stop back any branch that is growing too vigorously for the rest of the plant. If the plant is an irregular, bushy grower, always take out useless shoots as soon as they appear, and stop any that appear to take too much of a lead. If the plant is a straggling grower with long shoots, continually stop the ends of the branches. Stop even the cutting as soon as it is rooted, leaving only two pair of leaves, which in most plants cause four shoots, and when these four have made two good leaves and are going on, take off the ends just above the two leaves, and there will be two shoots for each. The stopping may then be omitted while the plant grows into the form you want it, but if any shoots are in the way of each other, take them out, you may stop the joints then as they may seem to require it; there must be no long growth. We have grown *Plumbago capensis* three feet high, three feet across, and without using or requiring a single support, and the same with others of straggling growth, and we confess that if we cannot show at exhibitions till we disgrace a plant with fifty props, we will never exhibit. There are some plants naturally pendulous, with branches too weak to stand out without props, but what does this suggest? Why that they are to hang down. We might as well prop up a weeping ash or willow as prop up any other weeping plant. The *Eriostemon cuspidatus* is a weakly, pendulous, or half pendulous shrub. Make it a standard: let its branches hang down all round. We can tell those gardeners who grow it in a cage, and drag its branches through the wires, that it is beautiful as a standard, and one of the most graceful of our greenhouse plants. It is half the battle to understand the natural growth of a plant; it is the other half to make the best use of that habit when you cultivate it. Some fuchsias are best as standards, some azaleas are best as standards, and the great care required in the management of these must be directed to the formation of the head. There ought not to be too many branches, but those which there are must be well divided to point outwards all round the head.

The formation of a standard is simple enough, no matter what it is. The stem that is to lead must have the lower side branches constantly removed until the stem has gone up as tall as we require it, but we must not while it is growing

take off the branches too high up. When we have seen the stem as high as we want it, the top may be stopped, to induce the side shoots of the head to grow, and the side branches may be stopped back to the second joint from the stem, to throw out each four more shoots. From these select those you mean to grow, and remove those which are useless. The pendulous habit will be shown to admiration. In short, no matter what the habit of a plant is, the gardener has to grow it to the greatest advantage; and he may as well hold the branches of a poplar down with cords, or prop the willow up with long sticks, as to constrain many of the plants that are tortured into an unnatural shape to show at exhibitions. The danger is, that while prizes are given for such distortions, the young gardeners, in places where owners will put up with it, will be brought up to the same kind of mismanagement; and we cannot too earnestly beg the conductors of the press to condemn it before the mischief has gone too far; for believing, as we do, that the press will have public opinion with it, the evil will by this means be checked. Although there are many who speak with great disdain of the idea that the press can influence them, we happen to know that with our single pen we brought down the Government itself, whose servants were at first very lavish of their abuse, to a sense of their subservience to public opinion, and at length forced them to adopt effective measures for the regeneration of Kew Gardens, which are now, what they never were until we took up the subject, a credit instead of a disgrace to the country; and we hope, by the same means, to see our exhibitions a credit instead of disgrace to British gardening. Many will tell us that they are forced to do as others do, or give up exhibiting, because encouragement is given to the production of unnatural growth; and this is to a great extent true: but we strongly recommend even those gardeners who feel obliged to do wrong, to grow some of their plants right; for it will come to this at last, if the judges and the societies do their duty, and the way to hasten this is for the conductors of the press to do theirs; for if there be no other objection to the mechanical torture which plants undergo, the horrible sameness displayed at exhibitions will tire the public; shows will be comparatively deserted unless variety can be given; variety can only be secured by natural growth, in which each plant will assume its own cha-

racter instead of being all forced into the same general form, and the only variation to be discerned is the colour of the surface. We hope we have said enough upon this important branch of practice to induce a general improvement.

THE GENERAL MANAGEMENT OF HARDY SHRUBS AND EVERGREENS.

MR. LOUDON used to say that specimen trees should be allowed to make their natural growth, and if we remember rightly, this was the management recommended at the Derby Arboretum. To some extent we subscribe to the propriety of preserving natural growth ; but some shrubs and trees when left to themselves grow distorted, and others would grow of an ugly form ; some would grow one-sided ; others would have some vigorous suckers grow from the bottom, and take away the richer nourishment from the rest of the shrub, which would be stunted, and at length dwindle away, while the strong sucker would, if neglected, become the only portion in health. We are no advocates for trimming shrubs after the manner of our forefathers ; we want no sugar-loaves and pyramids in box, no peacocks and dates cut out in yew ; but there must be some attention paid to the growth of anything that is to become a specimen. It is a common practice among some gardeners to trim up their box-trees to an even surface. Is this nature ? It is the very destruction of nature. Hollies are cut into all manner of forms : a sort of head, one above smaller, and bare stem between. Can anything be more artificial in appearance ? Our opinion is that an evergreen should have as little of the knife as possible, and that it is the destruction of all the beauty of a tree to cut it to an even surface, or to distort it in any way. But there are exceptions. You may want a plantation to hide a fence, and all it trespassed above that might be spoiling a view. In such a case as this the knife must always check the growth. Two or three points have to be considered even here. The shrubs must be adapted for cutting, to begin with, and the cutting must be as much like nature as possible, not a carving and clipping out a formal shape, nor to a smooth surface, but cut out whole branches close to the main stem, to keep an open though not a naked, appearance. The top must not be square, like the fence it is to hide ; here and there the branches must

stray above, and some upright shoots be permitted. In groups of trees and plantations generally there must be a constant overlooking, to see that no one subject shall overrun another; for, however much we may study the habits of shrubs, and calculate upon the difference between fast and slow growth, there will now and then be a different result from that which is expected, and the knife must go freely to work, to prevent one encroaching upon another, and to keep all in their proper proportions. It is in all plantations necessary, but especially in mixed ones. Again, in all variegated and worked specimens, the stock upon which the more delicate are worked will occasionally shoot, and, as we have observed already, in another part of the work, if they were permitted to grow, they would soon destroy and overgrow the worked portion. The stock of a variegated holly is the common green one; let this grow even from the bottom, and in time it will deprive the variegated portion of all nourishment, overrun it and kill it. All worked subjects are alike. The portion worked on the stock is always weaker than the stock itself; therefore the same fate will attend them all if their stocks are allowed to grow. Every bud should be rubbed off as it appears, but, as they will get overlooked, and do very frequently escape us, until they have made some growth, all worked plants should be periodically examined, to see that all shoots of the stocks are removed. With regard to the pruning of specimen plants, it should never be resorted to unless some vigorous sucker or shoot takes up the growing for the whole plant. In many shrubs this will be found occasionally, and if such a shoot were not shortened back, or cut right away, it would grow rapidly, while the rest of the plant would be actually stationary; but any attempt to constrain the form too much, to alter the character or thicken the surface, would be unnatural. In growing the different members of a whole family, the very distinction may be in the habit of growth, and to destroy this by artificial means would be to take away the interest. If a vigorous shoot be only cut back, it will throw out its lateral shoots, and make a close and ugly growth on one side of the specimen, and therefore it should be cut back to where the great strength begins, that the sap or the strength may be divided equally over the rest of the plant. The common laurel is an extraordinary growing plant. In ground that suits it, and a good situation, it will sometimes make four-foot shoots in a

season. If these, therefore, are wanted of a particular size, the new growth must be constantly cut away clean. There is no tampering with it, because it will grow out of all bounds. The Portugal laurel is not so outrageous; this does not make any long shoots. The *laurustinus* is apt to grow straggling unless checked; but the time to check it is while it is young. When they begin to start off, they should be examined weekly, and any shoot that has taken the lead should be cut back to within two pair of leaves of where the branch starts from, and so all through its young growth. The instant you observe a shoot seeming to run away from the others, cut it back directly. Magnolias are plants that we are all anxious to see bloom, and therefore they are never stopped; but they, as well as all other shrubs, should be, while quite young, stopped back when any shoot leads off, so as to form a bushy plant, unless it be intended for a standard, when the one upright stem is to be encouraged until it is as long as we wish the stem or trunk to be; but, generally speaking, all who desire bloom let a plant grow as it likes, that it may be the sooner in flower. All the *pinus*, *cedrus*, *abies*, and *coniferæ* in general, must grow as they will; the knife would be fatal. Their natural growth is pyramidical, whether the branches be pendulous or horizontal, and, if they lose their leading shoot, the plant is spoiled. It is no longer perfect, although we have seen a side-shoot nearest the top tied up to form another leader. There can be no question that the plant is for ever after imperfect. The lower branches are all we have to take care of; and, if we wish to preserve them, no weeds, nor grass, nor plant of any kind must be allowed to grow underneath. If it be grass under, it must be kept short as a bowling-green, whereas we too often see the grass left to grow rank, and work its way among the lowest feathery branches of a handsome specimen, so as to destroy the entire beauty of the lowest arms of the tree. Nothing will bear crowding. Three-fourths of the timber in hedgerows, and evergreens in plantations, are destroyed for want of room. Specimens on lawns should be planted in the middle of beds made the size the trees cover, and, as they spread, the grass may be removed further all round, to increase the size of the bed, for the roots are the better for the occasional stirring of the surface, on which not a blade of grass should be allowed to grow. In the Derby Arboretum there was a system adopted sufficiently absurd to

account for a large number of dead plants, and a still greater number of unhealthy ones. The mowings of the grass were swept to the beds on which the plants were growing, and left all round them to heat and rot there, under the silly notion that rotting grass would act as a manure, and nourish the plants. Of course it had destroyed many, and we left our opinion in a book which was handed to visitors for the purpose of noting their opinions and advice. Whether the destructive system was abandoned or not, we have had no means of knowing; but it appeared to us to be akin to insanity to constantly keep a dank heap of rotting grass round the roots of tender young shrubs, completely shutting out the air, and keeping them wet; but the result was palpable. A great quantity of labels told us what had been on the spot, and we suggested to an attendant that somebody should go round and paint on the labels "IN MEMORY OF" whatever plant was named thereon. Most likely many of the departed have been renewed, but nothing could be more destructive of the erica family, of which, however, very few remained alive, and not one in good health. Standard specimens may have the grass made good to their stems; first for appearance, and next because they do just as well as they would in beds, perhaps better. It may be well enough to leave a circle of uncovered soil while the tree gets established, because strong stakes must be driven down to keep it in its place; but as soon as trees are established, they may have the grass made good. Where evergreens are planted in families, and a regular group has to be formed, they do best in an uncovered clump, which must be kept constantly weeded: a foul bottom does more harm in a month than years will undo, if, indeed, it is ever undone. American plants only want the knife when some branch is taking a liberty with the rest of the shrub; but to be bushy, they must be checked when any part of them wants to wander abroad. Rhododendrons and azaleas are very apt to do this; a branch takes the lead, grows rapidly, quite beyond the general surface of the plant, and, if neglected, makes it downright ugly; but the check should be given before the growth has progressed much, so that, when stopped, the new growth within bounds may be completed. Perhaps the best time to prune all shrubs of the kind is directly you have had the bloom perfected and it has decayed, and before the young growth has made any progress, because the growth is then

equalized. It is made all at once, and, as you can see every branch that will grow, you can rub off the shoots that will be in the way, or of no use, that the strength of the plant may be confined to those we require, and that will add to the beauty of the specimen, always keeping the plant down, to prevent the bottoms from becoming bare, than which nothing looks worse. One of the most essential points towards this is plenty of room. Plants never grow well crowded. If they have not plenty of air and light below, the leaves fall, and the stems get bare, the lower branches die—these are invariable results of crowding. It is the room that is given to specimens that enables them to grow so perfect, whereas it is the want of light and air that renders so many plants in groups and borders so unsightly; and, unless it be to hide something, there is no occasion to crowd plants anywhere. Generally speaking, a belt is planted on purpose to form a tolerably close mass of foliage. In such case, the principal object is to prevent, by timely pruning, one plant from smothering another. The strongest growers are planted further back, to prevent this; but, unless constrained, there will always be a disposition in some to encroach upon others. As a general rule, the most common must be sacrificed to keep the best in permanent good order. As in good planting of mixed clumps and borders—the immediate effect being wanted—there is an abundance of common things intermixed with better, you are enabled to remove many altogether as the more valuable grow; some attention must be paid to this from year to year, because it is necessary to remove them before instead of after they do mischief. Again, as in good planting the evergreens ought always to form the main feature, some care must be taken not to destroy this very desirable character, because, if we remove even common evergreens, to make room for the deciduous plants, we spoil the winter scene altogether, by showing the bare stumps of leafless, though perhaps good, deciduous plants. It is to be borne in mind, that evergreens drop their leaves as well as others, but they do not drop them all at once, and never until the succession of new ones has clothed the plant. In newly-planted evergreens of a large size, or that have suffered a little by their removal, the entire foliage will often drop as the buds swell for new ones. Next to retaining all their foliage in health, which is the perfection of removing, it is good to see all the leaves drop, as a sign that the injury is

only temporary, and the plant safe ; but if the leaves dry on, it is a sign of dissolution. The plant may be given up for lost, if the foliage shrivels and holds on. Whenever, therefore, the roots have suffered much in the removal, the branches should be unsparingly cut in, many branches entirely removed, and the plant reduced to half its size. If an evergreen looks weakly, the only chance for it is heavy pruning ; retain but a skeleton, but let it be of a right form, so that when it does make growth, it may be of the proper character. It is no use to compromise the thing by half cutting it, in the hope of saving too much. Evergreens, as standards, should have all weakly branches growing inwards always cut away ; and evergreen standards are always exceedingly ornamental. The magnolia tribe make fine standards, rhododendrons are very showy, and even the Portugal laurel, the arbutus, and many other evergreens, though they may have no flowers to recommend them, look well as standards. The principal thing to avoid is formality, and there is a good deal too much of this among evergreens. Some of them are formal enough of themselves. The box, some of the arbor vitæ, and many of the firs, are almost mechanically formed, and can scarcely be touched without being injured. The knife, in fact, among evergreens, is only to keep them a little within bounds ; and when they are planted too close, this task is a little more difficult, because more frequently imposed on us ; but whole branches should be cut out ; clipping, or merely shortening, makes a hard, close surface, which is not desirable, for it gives everything a stiff and formal appearance.

THE MANAGEMENT OF VILLA GARDENS,

WITH MIXED PLANTS AND POT CULTURE.

THOSE who lay themselves out for a continual supply of flowers in a limited garden, must have recourse to the numerous ways of providing one thing under another to supply the places of declining plants, and so keep at all times ready the furniture which is to be displayed from time to time in the garden drawing-room as it were, the place always in sight. This may be done in two ways ; by keeping store-beds, from which things are to be taken up in perfection very carefully, and replaced where they are to expand their

beauties ; or it may be managed yet better by pot culture. In the one case you must remove things under a disadvantage, and sacrifice the health and strength of half-perfected roots and bulbs, or wait while they complete their growth, in which case the garden must be occupied by things out of bloom, and therefore untidy, or without flower ; in the other, no sooner is a thing past perfection than it is replaced. Pot culture restricts us, in some measure, to the size of a plant, because, if we constantly shifted them as soon as they required it, so as to spread to a noble size, the pots would be of a most unmanageable size. It is therefore necessary to restrain all the plants to a moderate growth. The stock of plants for the garden may consist of all the best of the perennials, and a few of the best of the biennials and annuals. The bulbs for spring blooming are necessarily a considerable time decaying, and if they are potted and plunged into the soil, they can be removed and replaced the instant the bloom decays. There are, however, some plants that are useless as soon as they have done blooming, and may be pulled up and thrown away directly. The principal plants for furnishing a constant succession of flowers may be thus classed :—

Mignonette ; insignificant flower, but very odorous ; six to twelve inches.

French Marigold ; brown, purple, and gold, various shades ; one foot to a foot and a half.

Dwarf Larkspurs ; blue, white, and pink, of several shades ; nine inches to a foot.

Collinsia bicolor ; pretty spike of blue, white, and yellowish flowers ; nine inches to a foot.

Convolvulus minor ; brilliant blue-purple ; straggling growth ; nine inches to a foot.

Nemophila insignis ; bright blue and white, small flower ; six to nine inches.

Erysimum Peroffskianum ; bright orange ; small pretty plant ; six to nine inches.

Double Balsams ; scarlet, crimson, purple, and white ; one foot to eighteen inches.

Sweet Peas ; various purples, and whites, and pinks ; two to three feet.

Calliopsis bicolor ; orange and brown ; one and a half to two feet.

Lupinus nanus ; purple, spikes of flower ; six to twelve inches.

Phlox Drummondii ; dwarf red, purple, and all the shades of them ; one foot.

Ten-week Stocks ; many colours, from Germany, all but yellow ; six to twelve inches.

China or German Asters ; many colours, all but yellow ; one foot.

Now these annuals are the most showy in patches, about the size of a thirty-two-sized pot, and therefore, if not sown actually on the borders where they are to flower, should be so sown elsewhere as to be easily removed in patches. But the plants, or rather the annuals we have mentioned, are of two classes ; one ought to be sown and thinned out, and allowed to stand where they are to flower ; the others ought to be sown, and, when large enough, planted out where they are to flower. Of the former we have the dwarf larkspur, *Collinsia bicolor*, *convolvulus minor*, *lupinus nanus*, sweet peas, *erysimum Peroffskianum*, and *calliopsis bicolor* ; of the latter, French marigold, *nemophila insignis*, phlox Drummondii, ten-week stock, China aster, and balsam, are the better for the check they receive in planting out. But where there is not room to sow all these things where they are to occupy room all the while they are growing without detriment to the garden, the management is as follows :—Sow as many patches of each as you anticipate you will want, in a bed in the back garden or nursery ; treat them just the same as you would if they were going to bloom there ; thin them properly, not allowing more than sufficient to be together, so as to weaken or draw one another up. Let them all be within the circle marked by a thirty-two-sized pot, and about six strong plants, or from that to eight, even of the smallest subject, is enough. These may be in the nursery bed until they are far advanced towards showing bloom ; when the subjects which they are to succeed are quite exhausted, and begin to look untidy, get a box barrow, and as you wheel it round, take your spade and lift out the whole spadeful of earth with the roots of the plants undisturbed, and lift it into the barrow ; do this with all you are removing, whether they are exhausted subjects, dead and done with, or perennials, or bulbs which have not completed their growth. Then, having left in each place the vacancy occasioned by removing a whole spit of earth, carefully water, so as to soak the ground all through below the roots, all the patches in the nursery bed

designed for removal to where they are to bloom, and take up each patch with a full spit of earth, so as not to disturb their roots, and remove them to the vacancies you have left in the garden. They may, with very little dexterity, be so well removed as not in the least to feel the change. The instant they are placed in their positions, give the earth all round a complete soaking, and then settle them in their new places. By these means pots are saved, and there is only a little more trouble. The sowing of those subjects which are to be planted out may be on a slight hot-bed. Hot stable-dung, a foot high, well pressed down, and six inches of good loam at top, will give heat enough for the purpose ; and you may either put on a garden-frame and light, or hand-glasses ; but, in either case, a mat should be thrown over all at night to keep in the heat a little. The seeds may be sown in March on this, not too thickly, otherwise it is a waste. If hand-glasses are used, take care that the seeds are sown within compass of the glasses. If a frame is used, the simplest way of sowing is in drills from front to back, and about six inches from one to the other. The seeds of all the sorts only require to be well covered, and the soil kept rather moist. As soon as they are up, they must have air by tilting the sash or light behind. Moisture must not be forgotten ; and the lights must be tilted so as to give abundance of fresh air as the seedlings advance, otherwise they would be drawn up. As soon as they are large enough to handle, thin them out a little, and put the plants that you pull out in by the side of the row, instead of throwing them away. A few of the balsams may be potted, if you have convenience for them, as they make very pretty pot-plants. Here you may give air all mild days, and shut up at night. In a couple of months, if they have had plenty of air to keep them from drawing, they will be in excellent order to plant out into the nursery-bed or the show-garden at once ; only recollect the places they are to occupy, the height they are to grow, and the time they are getting into blooming order. By careful observation you can plant many between others that are coming off before the newly planted ones flower. For instance, in May your tulips are in bloom, late Narcissus, and other things that have to come away soon. The nemophila should be close to the front, but the calliopsis, or coreopsis, is a taller subject, and must be placed behind. The *erysimum Peroffskianum*

is as short nearly as the nemophila. Ten-week stocks, and German or China asters, must not be far back. But, in a general way, mignonette, larkspur, Collinsia, nemophila, lupinus, phlox, and Ten-week stocks, may be said to belong to the front row, and follow crocuses, hyacinths, hepaticas, polyanthus, primroses, and similar dwarf things; while the sweet peas, calliopsis, China aster, convolvulus, French Marigolds, &c. may be placed a step behind, because they grow taller; and there should also be some other subjects there of a more permanent nature. The annuals, in fact, ought to be an addition only to the perennials, that should always occupy a considerable space. In managing a garden this way, a flower ought not to remain an hour after the bloom decays, but it should be removed with a spit of earth, and something else be placed there with a similar quantity of mould; or if the place is to be filled with transplanted seedlings, why, they need only be pulled up, and the place forked about a little, and dunged, perhaps, before the new ones can be transplanted. On this ground we prefer, even if we have no pots, to plant everything in nursery-beds in patches, so far apart as that we can take them up with a spadeful of earth without disturbing their roots; consequently, keep the show-garden well supplied, not with things that require growing, but with things ready grown, and all but blooming; the garden then never looks unfurnished. There are no flagging young plants; when one is past its beauty, it gives place to another ready to burst. Let the garden be laid out the same as for the work of a single month. Let there be abundance of all the early-blooming flowers. Let April see all the colours of the rainbow. Whatever has declined in May, turn out to make way for an abundance of May-blooming subjects. Let all that are turned out be taken up with a spit of earth, and all that take their places be removed in the same way. The nursery-bed that gives up the new subjects can receive the old, and the half-perfected bulbs may complete their growth as well as in the original place; meanwhile, in successive nursery-beds bring forward a succession of subjects. The gay tulip, the China and Damask China roses, the pyrus spectabilis and japonica, pansies, Wallflowers, double gold-colour and dark blood-colour; and at such times there must be enough of those in flower to make a good show. In June, the difficulty is to select, for

there is a blaze of flower, and all the annuals are rapidly aiding the general bloom. All the colours are plentiful, and if the place were extended to thrice its size, we feel that we could fill it. Nor does the next month find us in any difficulty for subjects in flower. The perennials take the ascendant as to beauty, the carnation and picotee, forming, themselves, a most gorgeous and most delicate subject. The Balsams, among the annuals, are now in perfection; the China aster, and many other subjects, being gay. The *Delphinium grandiflora*, with its dazzling rich blue flower, towers above the ordinary annuals, and is, for its time, the most striking subject in the place. The hollyhock plays its part for two months nearly, and before that is done with, the dahlia begins. And we know of no better way of regulating a garden to be thus supplied, than by cultivating all things in the nursery-garden at their proper season, and, when they will bear it, in successive seasons; and as soon as one set of subjects in the show-garden becomes shabby, to replace it with another, carefully removing the defunct, with a spit of earth, to the place where the new subject is to be obtained. If the defunct plant be worth keeping, let it take the place; if it is an annual or biennial, and is useless, let the earth only be placed there, and the plants be thrown to the dung-hill. We have given a list of the annuals to be depended on as the chief; we have been guided by their properties; they are the best in cultivation, although there are many more which bear a seed-shop reputation. But, in estimating all annuals, perennials, or other plants, in the open air, we have some guiding properties, without which we value them not. First, we want quantity of bloom; next, length of bloom; lastly, brilliance or denseness of colour. The only exception to these qualities is the mignonette, which we take for its fragrance. The perennials most valued must have some one of these qualities, though there is one which "covereth a multitude" of faults—the season of bloom. If we could find subjects full of blemishes which bloom in December and January, we should make room for them, however we require a choice from the following:—

Crocus; white, blue, and yellow; six inches.

Hyacinths; white, blue, red, and straw-colour; nine to twelve inches.

Jonquils; yellow; nine to twelve inches.

Daffodils ; yellow ; nine to twelve inches.

Narcissus ; white, yellow and white, orange ; twelve to eighteen inches.

Crown Imperials ; pale straw yellow, and orange ; two feet

Lupinus polyphyllus ; dark and light blue, white, blue and white ; eighteen to twenty-four inches.

Delphinium grandiflora ; grand dazzling blue ; three feet.

Hollyhock ; black, red, purple, lilac, mottled, yellow, white, &c. ; six to ten feet.

Dahlia ; shades of red, purple, rose, lilac, yellow, mottled, tipped ; three to six feet.

Columbine ; blue, red, white, and mottled ; two to three feet.

Pinks ; white, and laced with rose, purple, dark, &c. ; twelve inches.

Carnations ; white, striped with rose, purple, dark, &c. ; two to three feet.

Picotees ; white, laced with rose, purple, lilac, dark, &c. ; two to three feet.

Polyanthus ; yellow ground, blotched with dark-brown, crimson, &c. ; six inches.

Primrose ; double purple, double crimson, double white, double straw-colour ; six inches.

Hepatica ; red, double and single, white, ditto, double blue ; six inches.

Yellow Alyssum ; bright yellow ; six inches.

Anemone ; single blue, red, rose, white, and mottled ; six to nine inches.

Ranunculus ; turban scarlet, six to nine inches.

Scarlet Lychnis ; bright scarlet ; double, two feet.

These are all excellent subjects, and may be placed where there is a desire not to disturb ; but as they all figure in their season, and some are not in flower more than a month or two in the twelve, it may be a question whether any are permitted to hold a permanent place in the garden. Nor is it at all necessary that they should be all cultivated ; but there is this advantage in keeping up a garden of succession,—you have, independently of all the ordinary seasons, the chances of some being later than usual, and others being earlier than usual, so that you may always improve. There is scarcely a plant, whether it be bulbous, tuberous, or fibrous, which may not be well removed, if you take a full spit of earth with it, and

first soak the ground all round it, so that the earth adheres to the roots, and again soak it when it is put in its place, so that the earth may be settled down close to it. The trees and shrubs are necessarily the same, however the rest of the garden may be maintained ; and it is not to be forgotten that biennials, such as are worth the culture, may be depended on ; but many biennials may be treated like perennials, and be perpetuated by cuttings, and these, perhaps, are the principal useful ones. For instance, the blood and golden double wallflowers are splendid subjects ; and flowering early, as they do, and yielding the most beautiful aroma, they are in all respects grateful to the sight and smell. There are, however, others, such as the scabious, the Canterbury bell, blue and white rocket ; but for the most part they flower when there are so many better things in bloom, that, except in very extensive places, they are not very useful. The sweetwilliam is an exception, perhaps, but it is almost a perennial, and is now being produced very double and beautiful, and can always be perpetuated by cuttings, or layers, so that we hardly place it among the useless, but it must depend on the quality of the individual variety as to whether it be worth a place. All the subjects we have mentioned may be grown as we have directed in a nursery-garden, in patches not larger than a thirty-two sized flower-pot would cover ; and the time to remove them is, when they are about to throw out their bloom-buds, or before, if there be room to fill up, and nothing forwarder to place there.

GARDENS UNDER GLASS.

THESE, in all probability, will become general, for it is clear that the mere protection of glass, without artificial heat of any kind, will enable us to grow many hard-wooded plants hitherto confined to the greenhouse or warm pits ; and it is also obvious that hardy plants will be hastened in their bloom and preserved in their foliage by no greater protection than a well-built house with thick sheet-glass windows or sashes. There are a few rules to be observed in managing these gardens under glass, for this appears to be the proper name, where the only difference between the covered and the open portion of the garden is the glass which covers a part. A few rules may suffice. First, for instance, all the plants

should be turned out in the bed or border, or the pot itself plunged, because frost cannot so well go down after roots as it can get through the sides of a pot; next, the greatest possible care must be taken that the windows and doors shut close and admit no draught; third, that the windows and doors be always shut at sunset in winter time, so that the heat which has been absorbed all day shall be shut in all night; fourthly, that whenever the sun is warm, even in the depth of the winter, all the air that *can* be given *should* be given. It is impossible, indeed, to give a common greenhouse too much air in mild weather. If there are many top and bottom windows, open half of each, so that there is a thorough good air admitted. In dry weather especially, the house should be as open as possible, for the sake of drying it. There are many plants that will succeed better under glass than in the open air, although they are hardy enough to stand exposure—the daphnes, rhododendrons, azaleas (Indian and American), andromedas, camellias, many heaths, acacia, arbutus procera, deutzia scabra, all the liliums, most of the early bulbs; but suppose it to be planted out exactly the same as a bit of fancy garden out of doors, the plants under glass will be forwarder a good deal, so that this would create two distinct seasons if they were plant for plant alike. The hard-wooded Botany Bay plants will often stand a few degrees of frost, but under any circumstances, all the spring bulbs would be in bloom in February, instead of later; and we might walk out of the drawing-room into the garden, under glass, without the least difficulty, and see but the thickness of the glass between us and the most cheerless frost and snow, with the flowers blooming at our feet. The principal attention required is to the soil with which the beds and borders are filled, and the manner in which the drainage is carried out. There ought to be a clear run of water established, or rather the means of forming one—two or three ordinary drains, with drain pipes at the bottom, and stones or bushes to cover them six inches; and these pipes should communicate with an outlet capable of draining away any moisture that may filter into these pipes from the beds and paths, so that however freely you may water the plants or saturate the beds they will be free of stagnant water. The soil should be loam from rotted turves one half, and good chopped peat earth the other half. That this may be well

mixed, it ought to be placed in a heap and chopped down and thrown to another heap, and then chopped down again ; but however it be done, mixed it must be, and well. The plants should be placed in the soil the same as if it were the open garden, a box edging or a board edging, and smart gravel walks should characterise the ground work. The most effective way of planning the ground work, is a path of two feet six inches round a bed of six feet wide in the middle, and borders to occupy the space from the path to the walls, or rather the sides and ends, whatever they may be. There will be no great effect the first year without enormous expense, but the second you will have all the advantage of your own growth. If the balls of potted plants are very hard, it may be worth while to soak them and loosen all the fibres ; for you may in vain try to wet a hard ball : the water will run away and soak away without penetrating the surface, and the plant will become discoloured, weakly, and perhaps defunct. The syringe should be used freely, with a fine rose on, and by pumping sharply all over and among the foliage, and especially of the creepers, you will keep the green-fly completely under. Confine your plants as much as you can to evergreens, for you want it cheerful in the winter. Roses, however, you must have, and they will occasionally drop their leaves ; still there are some that must be had, and there is nothing more likely to give you a few fugitive flowers at Christmas. We have already said, water freely, but not often ; a good sousing with the syringe-pump once a week is better than a garden-pot watering once a day, and besides this, it keeps the plants clean and healthy, and saves labour. The plants may be cut in pretty close for effect at first, but some may be easily withdrawn when they begin to crowd each other ; unless, which is very desirable, you use your knife freely, and keep all things in a proper shape, and perfectly quiet.

A CHAPTER ON GUANO.

THE importance of every inquiry connected with guano, that very singular substance, cannot be questioned, and therefore it may be proper to take a cursory glance at its history before the investigation of its qualities. Very few years have elapsed since it was first applied, as a manure, by the English

farmer ; and, though we find a slight mention of it in one of the late Sir Humphrey Davy's lectures before the Board of Agriculture, no practical use was made of it upon the farm. Fortunately, we possess ample and correct sources of information in the valuable article written by a Mr. Walton, and recently published in the "Edinburgh Journal of Agriculture." To this, and to an Essay by Dr. Andrew Ure, reference will be made, and thus some effects will be obtained which cannot fail to gratify those persons who like to acquaint themselves with every particular that can lead to a correct understanding of the material they make use of. Mr. Walton tells us that the early writers of Peruvian annals mention the value of guano as a fertilizer—and adds, in a note, that Robertson, in his "America," has this passage,—“They enriched the soil by manuring it with the dung of sea-fowls, of which they found an inexhaustible store in all the islands situated along their coasts. The Spaniards have adopted the custom from the ancient Peruvians, and continue to use the guano, or the dung of sea-fowls, as a manure.” Dr. William Robertson first published his celebrated "History of America" in 1777, and thus we are certain that guano, as a fertilizer, was at least alluded to, by an eminent writer, fully seventy years ago.

Baron Humboldt brought, perhaps, the first specimen to Europe in 1804, and transmitted a sample to the French chemists, Fourcroy and Vauquelin, with a short report of his own, stating that “the fertility of the coast of Peru is founded upon guano, which is a great object of commerce. For maize, or Indian corn, it is, above all, an excellent enriching manure.” In 1806, the above mentioned chemists analysed the sample, and found it to contain “one fourth of its weight of uric acid, partly saturated with ammonia ; small quantities of sulphate and muriate of potash, phosphates of ammonia, magnesia, and lime ; also some flinty and ferruginous sand.” But the exact analysis quoted by Dr. Ure shall be given in its place, in order that a due comparison may be obtained. At present, our attention is confined to general facts connected with the history of guano. Mr. Walton favours us with the following, while he regrets the “backwardness, the distrust with which, in an enlightened country like ours, we refrain from adopting any new project, any untried expedient opposed to our old habits and customs.” He says also “that he himself had mentioned the subject of guano to persons of influence ; among

whom were Sir Joseph Banks, and the late Lord Sheffield, in 1810. Sir Joseph listened with attention, as the conversation at the time seemed to call back to his memory circumstances connected with the use of guano, respecting which he no doubt obtained his first notions while visiting the Pacific with Captain Cook." Mr. Walton also describes a process of manuring, by means of which he himself raised to high perfection a plantation of many thousand coffee-trees, while residing in the Island of St. Domingo. The material was the dung of parrots,—“the accumulated masses of hundreds of generations of those birds which congregated, at a certain spot, in countless numbers, and had never before been molested.” The reader is referred to the original article.

The highly fertilizing qualities of manure so obtained, in common with that of pigeons, doves, and even common poultry, depend, in a great degree, upon the circumstance that urinous secretions of birds are combined with the fæces of the bowels; but, although the excreta of land-birds thus generally surpass the fæces of animals, they cannot compete with those of sea-fowl, which feed upon fish, and are thus peculiarly rich in ammoniacal and earthy phosphates.

Walton cites a variety of authors, ancient and modern, who afford evidence of the surprising prolificity that results from the proper application of guano. One of these, Dr. Hipolito Unanuer, a Peruvian, published “Observations on the Climate of Peru,” in 1806. Humboldt has been already mentioned; but the highest authority on any subject connected with Peru, is that of the distinguished naturalist, M. Alcides D’Orbigny, who, in 1826, was sent, by the Directors of the Paris Museum, to explore the upper division and western coast of South America, where he remained till 1833. From consentient evidence, it is beyond doubt proved that “true” guano is a vast accumulation of the fæcal matter from sea-birds; and these birds, according to M. D’Orbigny, consist chiefly of the gull, gannet, pelican, cormorant, and phæten families, in flocks so vast “that, at certain seasons, their various tribes actually darken the air as they move along. All these marine birds, in consequence of their invariably reposing in large societies on the same points, and there passing the night, unceasingly augment the strata of guano; and as it does not rain in that part of the country, the surface is never washed by those heavy showers to which we are accustomed in Europe; these

masses, therefore, cannot be removed unless it be with the help of man."

Solidity, and a dry condition, ought to be considered indispensable—hence the guano of Peru becomes the only excellent and pure type. In the analysis of various specimens, sand, to a greater or less extent, is discovered. In those of the best, and alone valuable specimens, its proportion is very small—say from one and a half to three per cent. In climates where storms of rain and tempests are prevalent, the quantity of sand must superabound; therefore all the varieties are rejected, with the exception of those obtained from Peru and Bolivia.

As to the exact period of the introduction of guano to Britain it is impossible to speak; but, as Walton says, "Although several parcels had, by interested persons, been brought over for trial, its utility as a new fertilizer was not introduced to the notice of the public, upon any good authority, till the year 1841, when it was brought forward by the Royal English Agricultural Society.

Not quite ten years have yet elapsed since a manure of such importance became in any degree known to the farmer; it then sold from 22s. to 28s. 6d. per cwt. It is now brought in by thousands of tons annually, and the best is purchasable at from 10s. to 12s. 6d. per cwt., according to the quantity.

But guano, true as it may be, yet varies in quality; and Walton, though he brings forward, as we have seen, authorities sanctioning the belief that the localities which furnish it are rarely visited by rain, yet states that there are accidental changes of weather which produce disastrous consequences.

When, however, in peculiar localities, storms of rain occur, the guano suffers; and Walton tells us "that he is convinced the guano formations, which are left unsheltered on the surface, and often in a liquid state, have frequently, if not annually, been washed down by heavy rains, on one side, into the sea, and on the other, along declivities into the hollows below, to spots where the birds never think of roosting."

The uncertain condition of this most compound produce is not, therefore, to be wondered at, if we admit that it is exposed to rain, salt water, or to admixture with sea-sand. These causes of deterioration are natural, and occur on the spot; but, when we take into account the venal dishonesty of traders, the all-prevailing love of money, and the facility with

which a substance like guano can be adulterated by aid of loams of a corresponding brown tint, we perceive that the utmost caution is required.

PERUVIAN MODES OF APPLYING GUANO.

This is a consideration of great moment, and demands the testimonial of a genuine authority. Such is Mr. Walton. He says: "Their green crops, such as maize, millet, culinary vegetables, and esculent roots, were dibbled, and a small quantity of guano thrown into the bottom of each hole, which was sprinkled with light earth before the seeds and tubers were dropped, and then covered. As the growth of the plant developed itself, more guano was diffused, as near to the roots as possible; but in each operation the essential requisite of watering was never omitted.

"With the aid of guano, and acting upon these principles, on a limited surface, the Peruvians were enabled to raise sufficient subsistence for a large community; and in consequence of the slow and gradual solubility in the soil of those essential salts contained in the natural manure when not exposed to the air, and which give to its effects a durability possessed by no other compound,—as previously stated, they permanently cultivated the same lands without any variation of crops. Potatoes, maize, and millet constituted the principal food of the Andes tribes, and these they raised to the greatest perfection. Europe is, in fact, indebted to them for these three valuable articles of food."

Near Arica, according to M. D'Orbigny, the grounds are fertilized by small irrigating canals, which give to the sand mixed with guano the moisture requisite to increase the produce a hundred fold. He says: "I was astonished to see so beautiful and permanent a crop of maize, and more especially of the red pepper, which constitutes the principal commerce carried on in these valleys, whence the growers send it off to all parts in the interior of Bolivia."

Enough has now been advanced to prove the excellence of guano in its own climate. Its animal origin and immensely fertilising qualities are credibly affirmed: and it therefore remains to investigate its qualities in the condition wherein we receive it, when in the state of the utmost attainable purity.

Dr. Ure's analysis is very good authority so far as it goes.

The young analyst could not, however, proceed with sufficient accuracy from directions so general, and which are deficient in all the details of manipulation. Yet, general as it may be, it comprises ample comparisons of results as obtained by various eminent chemists, all tending to show what every one who undertakes an analysis of this substance must soon discover, that there are no two samples of guano which perfectly agree in their constituents.

Dr. Ure gives—first, the tabular catalogue of the constituents found by the French chemists in the sample presented by Humboldt, estimated in hundredth parts and decimals. We assume the grain of apothecaries' weight, as being the simplest integer, and thus in 100 grs. are found—

Urate of ammonia	9.0
Oxalate of ammonia	10.6
Oxalate of lime	7.0
Phosphate of ammonia	6.0
Phosphates of ammonia and magnesia	2.6
Sulphate of potash	5.5
„ of soda	3.3
Sal-ammoniac	4.2
Phosphate of lime	14.3
Clay and sand	4.7
Clay and organic matters	32.3
	<hr/>
	99.5
Loss	0.5
	<hr/>
	100.0

This might be reckoned as a fair sample of fertilising guano ; but the last named items, 32.3, are loosely given, because they do not particularise the proportion of water and organic matters.

The analysis of Professor Johnston is far less satisfactory. Thus—

Ammonia	7.0
Uric acid	0.8
Water, carbonic acid, and oxalic acids, } &c. expelled by a red heat }	51.5
Common salt, with a little sulphate } and phosphate of soda }	11.4
Phosphate of lime, &c.	29.3
	<hr/>
	100.0

This guano must, as Dr. Ure remarks, have been much decomposed, and perhaps originally a debased sample. It leads to no particular knowledge, and therefore little can be gathered from it.

Dr. Ure has exposed a fraudulent analysis, by which many hundred tons were sold at a public sale, and at a high price. He found the guano nearly rotten and effete. The false and real constituents are given side by side as below.

1.—Urate of ammonia, ammoniacal salts, and decayed animal matters } 17.4 Phosphate of lime, of magnesia, and oxalate of lime } 48.1 Fixed alkaline salts 10.8 Earthy and stony matter . . 1.4 Moisture 22.3 <hr style="width: 100%;"/> 100.0	2.—Ammonia 2.5 Urate of ammonia 0.5 Earthy phosphates 45.5 Sea-salt 9.0 Water 24.0 <hr style="width: 100%;"/> 81.5
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Here the deficiency in Dr. Ure's result must be supplied by the items, sand, dirt, and rotten organic matter, of no more value than so much very old dung reduced to dust. This was, however, an excellent specimen when compared with the adulterated rubbish which has been palmed upon agricultural credulity. Every one who has minutely inspected genuine samples must know that they are all brown in colour, the tint varying from that of Scotch snuff, interspersed with lumpy and white particles, to a deeper hue, according to the quantity of existing moisture. Hence there is no difficulty in substituting loams of various shades and temperaments. These, with a portion of decaying sawdust and a few pounds of fine guano (perhaps not one-twentieth part), to confer odour, would pass muster, so far, at least, as the unpractised eye might decide. In short, no one ought to attempt the use of this potent manure as pure without full assurance of the quality.

ANALYSIS OF VARIOUS MANURES.

Notwithstanding all that has been written and said of the various manures which are used in the dressing of land, and their effects upon crops, scarcely two chemists give the same analysis of any compound body, and this chiefly because they give the result in different states, some intelligible, some not,

but all various. We can hardly illustrate this better than by quoting Dr. Ure's analysis of Guano, and Voelckel's. The former is as follows :—

DR. URE'S.

Azotized organic matter, including urate of ammonia, and capable of affording from 8 to 17 (a pretty large difference) per cent. of ammonia by slow decomposition in the soil	50
Water	11
Phosphate of lime	25
Ammonia, phosphate of magnesia, phosphate of ammonia and oxalate of ammonia, containing from 4 to 9 (another <i>trifling</i> difference) per cent. of ammonia	13
Siliceous matter from the crops of birds .	1
	<hr/>
	100
	<hr/>

VOELCKEL'S.

Urate of ammonia	9.0
Oxalate of ammonia	10.6
Oxalate of lime	7.0
Phosphate of ammonia	6.0
Phosphate of magnesia and ammonia . .	2.6
Sulphate of potash	5.5
Sulphate of soda	3.8
Muriate of ammonia	4.2
Phosphate of lime	14.3
Clay and sand	4.7
Animal substances, with a small quantity of salts of iron and water	32.3
	<hr/>
	100.0
	<hr/>

We are not now going to allude to the discrepancy of the quantities, because that does not affect the question, but of the discrepancies of the terms and the nature of the results. Why are not the same tests applied and the same items mentioned? How can any farmer or person in any other class not versed in chemical affinities and the nature of them,

imagine that these two results are of the same article? It is as if scientific men were determined that common people should never understand them. One of these chemists produces no less than eleven different items or materials; the other sums up the qualities of guano in five. Can this be right? that is to say, can it be right for the guidance of inexperience? One more illustration of this and we have done: take the subject of cow-dung. Three analyses of this animal manure by three different chemists are thus given:—

The author of the “Muck Manual” says, the proportions of organic matter, water, and salts, in 100lbs. of cow-dung, are—

Water	83·600
Organic matter—	
Hay	14·600
Bile and resinous biliary matter	1·275
Albumen	·175
Silica	·140
Sulphate of potash	·050
Geate of potash	·070
Muriate of soda	·080
Phosphate of lime	·230
Sulphate of lime	·120
Carbonate of lime	·120
	<u>*99·860</u>
	<u>14</u>
	<u>100·00</u>

Morin’s analysis consists of—

Water	70·00
Vegetable fibre	24·08
Green resin and fat acids	1·52
Undecomposed biliary matter	·60
Peculiar extractive matter	1·60
Albumen	·40
Biliary resin	1·80
	<u>100·00</u>

* This is wrong in the addition, because the sum should be 100·46, consequently there is 46 over instead of a loss of 14. However, this is not material, except that it shows carelessness somewhere, but does not affect our object, which is to show that hardly two chemists agree in their terms, to say nothing of proportions.

M. PERROT'S.

Water	69·58
Bitter matter	·74
Sweet substance	·93
Chrophyle	·28
Albumen	·63
Muriate of soda	·08
Sulphate of potash	·05
Sulphate of lime	·25
Carbonate of lime	·24
Phosphate of lime	·26
Carbonate of iron	·09
Woody fibre	26·39
Silica	·14
Loss	·14
	<hr/>
	*100·00

With these discrepancies before us, how can it be expected that we, the uninitiated in the mysteries of chemistry, can arrive at any conclusion as to the value of cow-dung as manure? The amount of water in cow-dung is very large, and it is said to be the least valuable of animal manures, although used as a standard, much in the same way as copper coin might be used as a standard for the value of the better metals; but nothing could be more uncertain than cow-dung, in consequence of its large quantity of water, because, if exposed, it would not be of the same value two days together. The water would evaporate; consequently dried cow-dung, having lost the greater part of its water, would become a much more valuable manure. The author of the "Muck Manual" says, that, without violence to chemistry, the composition of cow-dung may be stated as follows:—

Geine	15·45
Salts	·95
Water	83·60
	<hr/>
	100·00

* This is as it appears in print; but it is wrongly added, because the sum is 99·80. However, this affects not our objection to the strange want of uniformity in the terms of the various results.

Proceeding in the same chemical expression and classification of contents, the following are the results of several other manures :—

HORSE-DUNG.

Geine	27·00
Salts	·96
Water	71·20
	<hr/>
	99·16

It is not so stated, but doubtless the deficiency in the hundred parts is loss; but the value of manure consists in its capacity to produce ammonia, of which we shall offer a notice presently. Night-soil, by analysis, yields—

Geine	23·5
Salts	1·2
Water	75·3
	<hr/>
	100·0

We are informed, then, by Mr. Falkner, that the following are the ultimate results of the three manures :—100 lb. cow-dung will yield of carbonate of ammonia about 2 lb. 2 oz.; horse-dung, 3 lb. and nearly a quarter; and night-soil, 15 lb. and nearly a third. The presence of nitrogen, which regulates the capacity of a manure to produce ammonia, determines the true value of the article, inasmuch, as by uniting with hydrogen, it produces pure ammonia. As a passing remark, we may observe that pig-dung is supposed to be upon an equality with night-soil; but it must always be recollected, that a difference of food makes a difference in the relative qualities of the dung of all animals. The experiments undertaken by the Prussian authorities, to ascertain whether the contents of the sewers of Berlin and Dresden could be applied to fertilizing the adjacent land, seems to prove that, if land unmanured produced three bushels for one sown, then—

Cow-dung would produce	7
Horse-dung	10
And night-soil	14

But it is not in sewers, which are receptacles for everything, that night-soil could be had in its unmixed state, and consequently we may consider that as underrated in value.

Poudret, which is a preparation of night-soil, good or bad

according to the honesty of the manufacturer, is ranked with guano, but next to night-soil. The value of poudret depends on whether the ammonia is lost or saved. "If night-soil be mixed with sulphate or muriate of lime before drying, the volatile carbonate of ammonia will be changed into sulphate of ammonia and *sal ammoniac*. Thus, not only the most valuable portion of night-soil will be retained, but the salts of lime will be much increased. The mixture will be perfectly inoffensive, and allowing ground-peat and plastic, with the other salts, to form one-half of the dry mixture, there is then in every 100 lbs. fertilizing proportions equal to 200 lbs. of the moist human excrement; and the value of good poudret is, as compared with cow-dung, as 14 to 1. Another kind of poudret is prepared in France by boiling the offal of the slaughter-house by steam into a thick soup, and mixing the whole into a stiff paste with sifted coal-ashes, and drying it. But perhaps soot is the most powerful of all manures. Its analysis is as under:—

Geine	30·70
Nitrogen	20·00
Salts of lime, mostly chalk	25·31
Bone-dust	1·50
Salts of potash and soda, and ammonia	6·14
Carbon	3·85
Water	12·50
	<hr/>
	100·00
	<hr/>

The salts, therefore, in 100 lbs. of soot, are equal to a ton of cow-dung. But among the subjects of regret to all who give themselves the trouble of thinking about such matters, that of wasting the liquid evacuations of animals is perhaps the most remarkable. The salts therein contained are beyond measure valuable; yet how rarely are they appropriated! how common is it for this and the drainings of the dung-yard to run to waste! Let us look a little to their composition and to their fertilizing qualities, and compare them with the analyses we have already quoted. We shall still keep to the authority of the "Muck Manual," the most useful work that has emanated from the press on the subject.

That of the cow contains—

Water	65
Urea	5
Bone-dust	5
Sal ammoniac and muriate of potash . .	15
Sulphate of potash	6
Carbonate of potash and ammonia . . .	4
	<hr/>
	100

Compare this with the dung of the cow. It appears already that 100 lbs. of dung afford 2 lbs. 2 oz. of carbonate of ammonia, while this gives 5 lbs. of ammonia in its urea, and nearly three times 5 lbs. in its other ammoniacal salts; in short, 100 lbs. afford 35 lbs. of the most powerful salts ever used by farmers.

The liquid evacuation of the horse contains—

Water	94·0
Urea	·7
Chalk	1·1
Carbonate of soda	·9
Hippurate of soda	2·4
Muriate of potash	·9
	<hr/>
	100·0

It is thus equal in value to cow-dung, pound for pound; but when we come to the subject of waste, the author of the "Muck Manual" tells us that every man wastes annually enough salts to manure an acre of ground. The liquid evacuations are equal in value to that of the cow: the analysis is not in all respects the same, but the value is. According to Dr. Thompson's analysis, the contents of 1,000 lbs. are more than 42 lbs. of salts, for there is not an ingredient that is not essential to plants. The analysis is as follows:

Sal ammoniac	·459
Sulphate of potash	2·112
Muriate of potash	3·674
Common salt	5·060
Phosphate of soda	4·267
Bone-dust, phosphate of lime . . .	·209
Acetate of soda	2·770
Urate of ammonia	·298
Urea, with colouring matter . . .	23·640
Water	967·511
	<hr/>
	1,000·000

Wrong cast, because these make up 1,010 instead of 1,000 ; but we suspect that the contents are right in all the essentials, and that the error is in putting down the deficiency as water, which is probably in the original not stated other than in words—"rest water." It is not, therefore, of any consequence as regards the value as a fertilizing matter. 54 bushels of soot and 6lbs. of salt produced larger crops of both the Altringham and Belgian white carrots than 24 tons of stable manure and 24 bushels of bones, though at half the cost. We cannot help wishing that there were some uniformity in the mode of recording the contents of anything analysed, that we might be better able by comparison to judge the value, and have more confidence in the gentlemen who undertake such tasks. It is greatly to be regretted that persons affording information cannot understand why one man should produce one set of combinations, and another chemist bring out another, when the two articles are the same ; but so it is, and we have seen nothing yet to reconcile us to the discrepancies which we have shown in the various analyses of guano and of cow manure. There is nothing like uniformity of terms, nor anything reconcileable to common people, in the fact of one giving a greater number of particulars than another ; and we take leave to remind these gentlemen chemists that nothing tends to advance science so much as uniformity among the teachers and professors, and their published opinions. Different terms may in some instances mean the same thing, but analyses made and published for general information ought to be all reported in the same language and terms, and the particulars given under the same heads. If professors would but remember that they are writing for the public, and not exclusively for one another, it would be useful to them, and lead them to be intelligible in their lessons, that the public might learn with facility, and study with profit and advantage.

CHEMICAL AND OTHER MANURES.

THERE are so many ways of applying manure, that the quantity to be given is very problematical. He who sows the manure with the seeds does not use the quantity which is necessary when the whole ground is to be fertilized. Chemical manures, and those which are rapidly soluble, should not be put in much below the surface, because the

rains wash it down quite low enough : and if we might advise, we should recommend all manures to be generally instead of partially applied, because you can better calculate the heart in the ground than when the crop is made to clear off all the fertilising qualities in the first season. We dislike all temporary applications of permanent manures. When the ground is all alike, there is some calculation of what it can do, and what it requires ; but when the fertilizer is confined to the ridge which is sown, and the other portions of the ground go without, there is no drawing a fair conclusion. We know the doctrine preached is that of putting on only what the crop will take off, and then the ground is alike after the crop is gone. Experience does not justify this. Try the experiment ; plant or sow on the drill, and between the drill and see if they grow alike. Not a bit of it. Let the gardener apply his manure alike all over the piece, as if he were going to sow broadcast ; he can then always judge what it will require, or if it will require anything, for the next crop, much better than if he partially dressed just where his plants are to grow. Salts of all kinds and chemical manures should always be mixed with three, four, or five times their weight of sand or light earth, and then laid evenly over the surface. He may then fork it in with the top three or four inches ; and having given it a good soaking with water, it may be prepared at any time for sowing by merely raking the surface, and it is ready for planting without raking.

All ground ought to be dug well before any of the chemical or easily soluble manures are applied, because it does not answer to put them in so deep as dung is usually put. But the most even way of applying soluble dressings is in water, sufficiently diluted that the soil may be equally wetted three or four inches deep.

Among the popular manures of the present day there are many which are efficacious or mischievous according to the quantity. Salt, for instance, may be applied at the rate of 3 cwt. per acre with advantage ; but Mr. Johnson says it may be given at the rate of 12 cwt. We know that crops have been killed with less, but that says nothing. Alum, by the same authority, must only be given at the rate of 40 lbs. per acre. Bone dust, or calcined bones, a ton and a half as the maximum, half the quantity as a minimum. Carbonate of ammonia 160 lbs. ; carbonate of soda, from 160 to 640 lbs.

(a wide difference); Daniel's Bristol manure, half a ton : graves, half a ton ; gypsum, 40 lbs. ; Hunt's new fertilizer, 320 lbs. ; Liverpool animalized manuring powder, 27 cwt. ; muriate of ammonia, a pound to a rod ; muriate of lime, 2 lbs. ; nitrate of soda, 160 lbs. to the acre ; pearl ash, 320 lbs. ; phosphate of ammonia, 160 lbs. ; rags, 3 cwt. to 12 cwt. ; rape cake and rape dust, 6 cwt. ; saltpetre, 160 lbs. ; sulphate of ammonia, the most useful of all perhaps in gardens, 1 lb. to the square rod ; sulphate of magnesia, 1 lb. ; sulphate of potash, 2 lbs. ; sulphate of soda, 2 lbs. ; superphosphate of lime, 80 lbs. per acre ; urate of London Manure Company, 320 lbs.

These are, in general, the quantities published on the authority of the dealers, and adopted by Mr. Johnson in 1844 ; but the improved methods of applying them, and the facilities with which the best article can be procured, instead of the spurious, enable the cultivator to save from the quantities named, except when the article is distinct and alone, as sulphate of ammonia or sulphate of magnesia. The mixtures sold by individuals and companies must be used according to the dealers' directions, because they alone know the strength. They are interested in telling us the best quantities, because manuring being the most costly part of cultivation, drives men to the best and cheapest market. Poittevin's disinfected manure, Potter's guano, Hunt's guano, Lane's carbon, Lane's humus, Law's patent manure, and some others, can only be appreciated after being used as directed by the vendors. They know the quantity most efficacious, taking price and usefulness into account. Many of these prepared manures are from night soil, the most valuable of all if properly applied ; and it is to be regretted that a single shilling should be expended in imported manures while millions of pounds' worth of the soil in this country are washed away in rivers, to the detriment of the water and the loss of the state. As, however, nine-tenths of the community do not know how to apply it, we will give a hint upon the subject.

It is easily disinfected with sulphate or muriate of lime ; and if mixed with its bulk of peat earth and dried, it will be fit to transport anywhere, and will be found fourteen to one stronger than cow-dung.

IMPLEMENTS AND MATERIALS.

It has been said over and over again that a good workman can do his work better with a few ordinary tools and implements, than some who fancy themselves gardeners can with all the fashionable instruments. If a gardener could not do without all that Loudon recommends in his *Encyclopædia*, he must absolutely be a man of some capital even to buy his tools, and require a cart to carry them about. No less than eighty-eight implements are described and figured, and others described only. If the gardener goes into a tool shop, he may take his choice of fifty different varieties of hoe, but he would not want more than three or four, and the next that goes in may choose them all different. It would be useless, therefore, to mention more than three or four. Again, with respect to spades and forks, a man might desire a broad spade for digging, and a smaller one for planting; and forks would offer him a choice of three, four, or five prongs, but he would only want one fork. We propose to give a list of the tools a man would require, and also to add in this chapter the machines and implements, such as barrows, engines, mowing machines, &c. We shall first mention the ordinary tools that every gardener must have.

1. **THE SPADE.**—We recommend two, one as large as the man can handle well with ease to himself for hard digging, and a narrower tool for planting.

2. **THE FORK.**—Of late years it has been found that digging in many cases can be done easier and better with a five-pronged fork than by a spade, and, moreover, that it tears the ground to pieces better. These forks are made of well-tempered steel by Dray, of Swan Lane, Thames Street; and it is astonishing how much more ground can be gone over in a day, and that too with half the labour that it could be done with the spade first, because the fork is some pounds lighter, and secondly, because it is easier thrust into the ground.

3. **THE DUNG-FORK,** used for turning over dung, making hot-beds, &c.

4. **THE DIBBER.**—This is an instrument to make holes with for planting. It has a handle like a spade, is from twelve to eighteen inches long, and is iron shod, so that it does not cling to the soil, and makes a smooth round hole.

5. **THE TROWEL.**—This is a sort of scoop shape, and is used

to plant small subjects with, and making holes for bedding out potted plants ; they are of various sizes, but one size is sufficient ; it is also used to take up plants with, so as to save all the fibres.

6. THE HOE.—Of these there are several sizes ; one sort has the blade fixed across the end of the handle, and is used for chopping up weeds, loosening the earth on the surface, drawing the soil up to the stems of plants, drawing drills, thinning out crops ; the widest may be six to nine inches, the narrowest may be one and a half to two inches, and one between them. The Dutch or thrust hoe has a sort of horse-shoe form, a blade being fixed across the two points, and the handle fixed to the centre of the bend ; this is used to chop weeds by thrusting it forward, just below the surface ; some have two sizes, one for rough work, where there is plenty of room to move, and the other to use in flower beds and borders.

7. THE RAKE.—This, which is only a coarse comb set across the end of a long handle, is used to level and regulate the surface after digging or hoeing, to clear off loose weeds, stones, and rubbish, and to rake in seed after sowing. These also should be of two sizes, one of eight or ten teeth and one of five or six. A large wooden rake is also necessary to clean up the lawn after mowing.

8. THE EDGING-KNIFE is in the form of a cheese-knife at the end of a handle like a spade handle. This is to cut the edges of the lawn when the grass encroaches on the beds or paths. It is also used to cut out clumps upon the lawn.

9. TURF CUTTER, OR TURF IRON as it is called, is used to take up turfs for laying down as a lawn, and is only required in places where there is turfing to do. In establishments where there is much lawn it may be required for occasional mending ; some use what is called a turf racer, to cut the turf a proper width, and the turfing iron is then thrust under sideways, and is made to reach from the outer edge to the cut made by the racer. Where there is not a great deal to cut, the edging knife will do it quite as well.

10. BROOMS.—These are required to keep the walks clean, and sweep the lawn after mowing and raking. The birch-broom is best adapted for this. Some have a different broom for the inside of the houses.

11. GARDEN-KNIVES.—A large and small pruning-knife and

a budding-knife : these are of various forms and sizes. The asparagus knife is in fact a saw, about four inches long, at the end of an iron shank, which is thrust into a wooden handle.

12. THE BILL-HOOK is to use for chopping off limbs of trees and shrubs too heavy for the pruning-knife.

13. SAWS are useful for removing branches that are too large for the bill-hook, and smaller saws are used for pruning and cutting back branches which require to be shortened.

14. PRUNING-SHEARS. — These are made of various forms and sizes ; but the one called the rose-pruner is the most useful by means of a lever at the joint ; the wood is separated by a complete draw cut. Some are made of a much larger size, and with long wooden handles to reach a considerable height and remove tolerably large branches.

15. EDGING-SHEARS are used for clipping the edges of grass after mowing, and hedge or ordinary garden-shears are used to trim box edging, clip shrubs and hedges.

16. SCYTHES for mowing are of several kinds, but all drop now into two principal ones in general use : Boyd's Patent Vulcan Scythe, which is plain and sharp, and the blade so bilted that an old one is removed and a new one fixed in less time than it takes us to write it ; the other is Boyd's Self-adjusting Scythe, which can be set at any angle, and changed from long to short grass, and adapted for tall or short mowers by only turning a screw or two.

17. A MOWING MACHINE is of great service where there is much lawn : these implements are much in use in good establishments. Several different patents have been granted, and four have been publicly tried at Chiswick : Dray's, Green's, Shanks's, and Farrabee's. We have had Dray's in use, and find it answer every purpose, mowing very clean and even. They cost about six pounds—less than any of the others the same size.

18. GARDEN ENGINES are made of many sizes and different powers. One of these is very useful to water things overhead after the sun is down, or to water crops.

19. THE SYRINGE.—Nothing can be well cultivated under glass without the use of the syringe.

20. WATERING-POTS, large, middling, and small : it is well to have an extra length of spout to one of them, to reach some distance. There is a new one called Glenny's.

21. **THE WHEELBARROW.**—An implement constantly in use to fetch and carry ; and the Water-barrow, to take a quantity for supplying the water-pots.

22. **HAND-GLASSES AND BELL-GLASSES,** for protection and propagation.

23. **STEPS AND LADDERS,** for pruning fruit-trees and getting fruit : these must be according to your wants and of several sizes.

24. **NAILS** of all sorts, and shreds for nailing fruit-trees and climbers on walls or house fronts.

25. **GARDEN ROLLERS,** broad ; and, if there be any geometrical garden with gravel walks, you must have one narrow.

26. **BASS MATTING** is one of the most useful materials in the garden. It is used for all sorts of ties when plants are supported by sticks. Pink and carnation buds are tied up with it. Gardeners use it for blanching lettuce, early cabbage, and endive ; for tying on the grafts of trees and buds of roses and the plum tribe ; for covering the frames and lights of cucumbers and melons ; in short, it is used for shade in summer and warmth in winter. When a mat is wanted to be used for ties, it should be at once unravelled, the finer portions put in one place for light tying, such as hot and greenhouse plants, buds, &c. ; the coarser sort for heavy tying, such as dalias, hollyhocks, &c. to their stakes. These bass mats come from Russia, and are sold at all the nurseries.

27. **FUMIGATING-BELLOWS.**—These are made several different ways. A Mr. Brown, of the Customs, we believe, patented one which had a circular box, in which a wheel was rapidly turned to create the wind ; and a new one upon a still better principle has recently been invented by a Mr. ——— which is more effective : the old bellows for fumigation is rarely seen. The tobacco in all cases is lighted within an iron case, and the wind goes through it.

28. **GARDEN LINE.**—This is essential for all kinds of planting : being stretched tight, you may walk along it and leave the mark on the ground, then stretch it as far off as your rows are to be apart and make a second, and so continue until you have marked all the piece with lines one way ; you may then cross them at proper distances, so that a plant goes in at every place where the lines cross.

29. **LABELS FOR PLANTS.**—Practice has long decided that

the best label for plants in private collections is zinc, painted, and written on while wet; we know they are not impaired in twenty years. The next best, for all practical purposes, is wood; especially for all the nurseries, because, painted, and written on while wet, they will last till the plants are got rid of, and are very inexpensive.

30. SIEVES, of various sizes, to sift compost.

31. SCREENS OR SHADES, generally of calico or canvas, on wooden frames, to use for sheltering plants from wind, or shading them from the sun.

32. BASKETS, of various shapes and sizes, for packing fruit, gathering marketing, &c., as presents; half-sieves, sieves, bushels, loads, and barges,—technical terms for the different sizes.

33. TURF-BEATER.—A good heavy slab of wood, two feet long and a foot broad, and three inches thick on the middle of the back, which is rounding; a hole is made sloping in the centre of the wood, and of such a slope that it may be lifted up and fall flat every time, by which two feet of the turf is flattened at once.

34. LEVER.—An iron like a crowbar, spread out a little and bent rather rounding, so that the end, which is made like the claw of a hammer, can be put under a heavy weight of any kind, and be lifted up by merely bending the thing down; but every stick or stake may be called a lever, when used for the long end to give a great purchase: a spade or fork is a lever when you are bending it down to raise a spit of earth.

HINTS TO AMATEURS.

RAIN-WATER is the best for watering plants of every description, and not a drop should be wasted; every drain from a house-top ought to be received in tanks or tubs, for pump-water is to a certain extent injurious, and in some places very much so; nor is it the clearness of the water that bespeaks its purity. Next to rain, river-water is best, but by no means so good.

MILDEW.—Black sulphur, sulphur vivum, flour of brimstone; these are of use in a fine powder, for there is nothing else that we know of to touch the mildew, and that will. We have never paid much attention to the kind of sulphur we

used, except that it was finely powdered. With this tied up in a muslin bag, sufficiently open, or a pepper or dredging-box is better than either one of the old-fashioned powder-puffs, it is shaken or puffed on the leaves and fruit, some of it is also put on the pipes, if the vine be in the house, which is then to be shut up close for twenty-four hours ; it may then all be syringed off, and if the mildew has not disappeared, do it a second time. Out of doors you cannot shut up the vine, but in other respects do just the same. If the sun happen to be very hot it may be all cured the first time, but it is better to give it a second time.

BLANCHING is shutting up a vegetable, or a portion of it, from the daylight, by which it is turned white. It applies to the earthing of celery, the covering of sea-kale, the tying up of cabbages or lettuces, and also the covering or tying up of endive. It whitens whatever portion is covered, hence the term blanching. Plants grown in the dark would be nearly white, and very weak, altogether unable to sustain their own weight. If plants are too crowded they get pale and weak, for they have not the full light ; without light the green cannot appear in the leaf, nor the colour in the flower, and whatever deprives a plant of the light in a greater or lesser degree affects the strength and colour of it.

GRAFTING-WAX is made of bees'-wax and resin in equal parts, and lowered with tallow till it will melt at a temperature that will not damage the trees, but harden on cooling sufficient to stand the ordinary heat of the sun. Some gardeners paint one side of strips of calico, and bind them round the graft ; often a single tie fixes it in its place. Grafting-clay, or clay kneaded till all the air is squeezed out of it, after mixing one-fourth of neats' dung with it, is more frequently used.

HORTICULTURE may be applied to the cultivation of fruit and vegetables for man ; FLORICULTURE, to the culture of flowers and flowering plants ; ARBORICULTURE, to the growing of trees ; and AGRICULTURE, to the whole system of farming. These are, at all events, the common acceptations of the words, and well understood. It would be difficult, perhaps, to find where one leaves off and the other begins, but such is the understood meaning of the words as now applied. Perhaps horticulture is the most popular ; for people who have hardly the capacity to think, yet will have sense enough to appreciate eating. Many a man would leave a hundred other flowers for

a cauliflower. But floriculture is not to be despised, for a flower-garden pleases nine out of ten, and many will go a long distance for a stroll at Kew or Hampton Court.

PRUNING THE BLACK CURRANT.—The Black Currant does not like the knife, yet without some little management the bush would be a jumble of weak shoots. It must not have the strong branches cut back, but whatever branches, or rather twigs, grow inwards, must be cut clean away at the base; strong branches, therefore, should be allowed to grow, except those which grow inwards, and weakly shoots be altogether removed. They must in no case be spurred, as other currant-bushes and gooseberries are. If, however, any branch grows right away from the rest, and appears to run out of bounds, it must be shortened down to a strong eye or shoot, which may take its place as it grows. The Black Currant, therefore, becomes a large dwarf tree, and if kept clean and in good order, and free from the little spindling shoots which would otherwise choke up the head, it bears the better for age, and it is not an uncommon thing to see them six feet across. They, therefore, soon grow into each other, unless planted a considerable distance apart; eight feet is not too much room, for there will then be space to go round each bush to gather the fruit. When the bushes are young, they must be cut back enough to form a good bush, that is to start branches enough to grow out all round, and this must be done while small and before they begin to bear fruit; the next year remove all the shoots that do not assist in forming a good round bush. We have nothing to do afterwards but remove weak and useless shoots, or, which is still better, rub off the buds that would produce them, and so throw all the strength of the plant into the useful growth. When grown on a wall they may be trained fan-fashion, and be allowed to cover every inch of it as far as it grows, but even then nothing must be shortened; cut weak twigs away altogether, or leave them on, for cutting back only creates a good deal of small wood too weakly to bear. They must be fastened like other wall-fruit trees, and regulated as to the number of branches while quite young.

CLIMATE.—As our climate is beyond our control, those things which will not bear it must be supplied with an artificial one that will suit them. For this purpose we provide frames and glasses for such as want a little help,—that is to

say, subjects that will bear anything short of hard frost,—pots and greenhouses for those that will bear none, and stoves and warmed buildings for plants belonging to the tropics and warm countries. In supplying artificial climate, there are several points to be attended to. One is, that in all parts of the world the darkness is colder than light, night colder than day,—even where it is light all night, shade is colder than sun. We think we can hear our readers exclaim, “Well, any fool knows that.” Be it so; but many gardeners, in giving artificial climate, act as if they did not know it,—they make up their fires at night, and reverse the order of nature, their plants are shut up and the house heated more than it has been all day. The more they know what we have told them, namely, that night is colder than the day everywhere, the more they are to blame for reversing it when they pretend to imitate the climate of foreign countries.

ROOT PRESERVING AND STORING.—The great points to aim at in the preservation of roots, are coolness and dryness, and not to admit frost. Potatoes, parsnips, carrots, turnips, beet-root, mangel-wurzel, horse-radish, dahlias, asparagus, and tubers and bulbs of all kinds, must be kept from heat, wet, and frost. No matter how cool short of frost, no consequence how dry if cool. Cellars underground, when dry, are excellent places; but when there is no proper place, parsnips, carrots, mangel-wurzel, beet-root, and even dahlia tubers, may be pitted in the same way as potatoes,—that is, piled in a bank covered with straw, and six inches of earth over all of it. By choosing a dry shady place, these may be as safe as they would be in a dry cellar. But where there are proper apartments, outhouses, and cellars, there is this advantage,—they can be used from day to day, whereas a pit opened daily would soon spoil the remaining stock. Bear in mind, then, that all you have to do is to keep any or all roots and tubers from frost, heat, and damp, and they will be safe.

GLASS is a very important item in a garden establishment. It is all over the place,—occasionally and often gets broken, when nobody did it. We chiefly mention the subject here to recommend that some be had of all the sizes of the panes in use, that when an accident happens it may be immediately repaired. The heat that escapes through a broken pane in the roof can only be appreciated when the house is fumigated with tobacco; to stand outside and see the smoke issuing

forth will enable any one to form an idea of the waste of heat. Glass can always be had cut to any shape and size, and in new establishments we always recommend as much as possible of the framing and roofing glass to be the same size.

FLOWER-POTS.—The flower-pots are the most ancient of all patterns of garden apparatus, unless we go to the tools, which are now much the same as when the oldest book on gardening was printed. Many attempts have been made to introduce new fashions, and some of them were well enough if only half a dozen instead of half a thousand were wanted: but there is nothing half so good as the old-fashioned pots, wider at the mouth than at the bottom. These are made in sizes called thumbs, which we may call two-inch pots, and sixties, which are three-inch, and these are sold in casts, sixty to the cast; four-inch pots are forty-eight to the cast; five-inch are thirty-two to the cast; six-inch, twenty-four to the cast; eight-inch, sixteen; ten-inch, twelve; and so on; increasing in size as they diminish in number to the cast, up to twenty-fours. They are all of a price, retailed at about half-a-crown to three shillings per cast: beyond that size, the price is rather arbitrary. The pottery at Phillips's, Weston-super-Mare, is conducted on another principle. His smallest are No. 1, and he goes on with Nos. 2, 3, 4, up to No. 20, which, we believe, is twenty-two inches in diameter. These pots are the best that can be made, and after years of usage will wash and look like new. Even the great distance from the metropolis does not prevent many from using them in preference to any other. Some of the splendid specimens at Kew are growing in the Weston-super-Mare pots. Some pots have been made with feet to stand in saucers, to keep the bottom drain-hole out of the water that runs through; for to stand in water is death to many plants. Others have been made with hollow sides, to be filled with water, that the sun may not burn the young fibres next the side. Some are made with gutters all round the top rim, that a glass shade may cover the plant; and the edge being in this gutter filled with water, and so excludes the air, these are admirably adapted for fern-growing in dwelling-houses; each being, so far as the plants are concerned, a small Wardian case: they are also adapted for covers; made of the same material as the pot, they are to exclude the light: with these covers, sea-kail can

be forced, because the pot can be removed into a dung-bed, or, for that matter, to a dung-heap: with glass covers, they will do to strike cuttings in: and upon the whole, they are a useful pot. Phillips has recently made us some pots for growing verbenas: the body of the pot is like another, but the upper part, occupying one-third of the whole height, they turn outwards and form a broad dish, giving us a surface twelve or fourteen inches in diameter, on which we can spread and peg down the plant to cover the whole. It has been usual to grow them in large pots, and have a round wire trellis, about two inches above the pot, and so tie the plant down upon it to cover it. These pots will, doubtless, become popular for that purpose; they are light, compared with a fourteen-inch pot, and yet possess all the advantages of one that size; and we must admit that the appearance is greatly before a platform of wire-work. Many pots are made ornamental; to describe these would be an endless task: they should be used to set other pots in, that they may be changed as often as the owner pleases; not to grow them in on any consideration.

SEED-PANS.—These, in the usual way, are only half or a third the height of a pot; for, as they are only used for a short time, half the depth of soil is sufficient; but recently, Mr. Ball, of the Pottery at Deptford, Sunderland, has introduced square pans, so that there is not an inch of room wasted, and this is of immense advantage. We have a few dozen in use, and the saving of room is very great. A crate of these is about eight dozen, and the carriage about ten shillings within three or four miles of London. The pots from Deptford are very superior, probably in consequence of the quality of the clay.

IVY AND OTHER UNDERWOOD.—Ivy may be considered a very curious kind of underwood, seeing that it is a most vigorous climber, but it is also one of the best possible carpets for the ground under large trees. We recommended it years ago, but saw its failure more complete than any other failure that we ever witnessed, and that entirely through the worst mismanagement. All gardeners should know, that close to the stump of a tree there can be no nourishment for anything, yet a score vigorous plants were placed as near the stem of a large tree as depth of soil to hide the roots could be got, and then were trailed along the ground, but in some years had

made no progress worth mentioning. The only way to make ivy a good carpet is to plant it outside, instead of inside, and train it along the ground inwards towards the stump. Say a cedar has neither grass nor any other vegetation under it for a circumference of thirty feet distance, or one hundred and eighty feet. Thirty plants of ivy would reach all round at six feet apart, but as the sooner the ground is covered the better, use sixty plants three feet apart, and let these plants be well grown, with six feet of growth already. Plant the Ivy all round at these distances, and peg the branches inwards towards the tree, but spreading them wide enough apart to cover the ground as well as you can so far as they go. These plants derive their nourishment from a part of the ground where the rain and air reach them partially, and where the influence of the roots of the tree does not reach them. Their growth is rapid, and is to be constantly directed inwards, and will reach, in an incredibly short time, the stump of the tree itself, the ground being closely covered with Ivy, as if it were a mat of it. Nothing is so sure as its growth, for no matter how barren the ground under the tree, it will progress so that the roots are but well provided for.

It has another good effect; it kills all sorts of weeds and other vegetation wherever it assumes the lead, and when thoroughly established, begins to grow upwards, that is, assumes a shrubby habit at the joints. It has this great advantage over other underwood, it derives its chief nourishment far from the barren place which it covers, and other underwood has to live on the place it has to cover. The *Berberis Aquifolium* and varieties will live almost on nothing, and under the most impenetrable shade. The *St. John's Wort*, common Laurel, and some other subjects, will exist in bad soil, but the Ivy grows vigorously and healthily even if the ground it has to pass along and cover were solid stone. It is worth anybody's while to try the experiment in any barren place; but let the root be at the edge of the starvation space, and so get the nourishment it requires, while its branches will fare as well on a surface of hard gravel as it would on a brick wall; and we have all seen Ivy many feet from its ground root, wandering over all sorts of surfaces, from the rough bark of a tree, to the hard smooth surface of a stone wall. There is not a more obedient servant than Ivy, but he is a bad master; he will conquer whatever he lays

hold of, if it be an oak or a stone wall ; nothing can resist his grasp. The roots will insinuate themselves into crevices of stone, and raise a ton weight by the mere operation of swelling ; but nothing was ever more completely under control. It may be directed anywhere, and be made to cling to anything. It may be grown up a stump, to form its own head like a tree, or be made to cover a wall like a curtain, or the earth like a carpet. In short, it is a magnificent ever-green, adapted for a thousand purposes, trainable in any shape, and not half valued, because its worth is not half known. Nothing was ever more true than the line of the song,—

“ A rare old plant is the Ivy green.”

PRUNING THE DAHLIA.— A little practice is worth a good deal of theory ; and while we leave to others the details as to the probable why and wherefore, we shall simply give a few hints as to the mode we have successfully adopted in the pruning and training of the Dahlia. We believe the practice of many, who cut their plants into mere skeletons, with a notion that the less the root has to do the larger the flowers come, is subsiding a good deal ; we have always reprobated it. We have always felt confident that the flowers derive great nourishment from the leaves as well as from the roots, and have always acted on that supposition. We have invariably abstained from cutting off a single branch, unless two were in each other's way, in which case we removed the weakest, or it was coming too weak to bear a strong bloom, in which case it would do no good. It may be taken safely enough as a proved fact, that the less flowers there are permitted to perfect themselves on a branch the stronger the flowers will come, and the more there are the weaker they come, consequently there could be no mistake in thinning the buds ; but the Dahlia is monstrously uncertain, and if we reduced the buds as soon as they appeared we might remove those that would come perfect and leave those that would not.

It is necessary, therefore, to allow the buds to advance far enough to promise a perfect bloom before we select those we mean to leave, and having made up our minds which afford the best chance of perfection, we may remove all those in the immediate neighbourhood. The benefit of this will be easily seen in the increased size and perfection of those left on the

plant. And it is equally important that the instant we find a bloom is coming bad or unfit to show, or the instant it be gone by its perfect state, it should be taken off, because it is weakening the powers of the plant as long as it remains on. The first side shoots from the main stem will all yield large showable flowers, and therefore stakes should be driven to fasten them to as they grow, and they should be fastened so as not to be in each other's way. But when these side shoots throw out their lateral branches they would be too numerous for all to remain on the plant, and therefore such of them as come weakly or can be spared without detriment to the plant, should be taken away while young, and so should all those that sprout out again near the place they are taken from. As a general rule, besides all these, there is one that should be observed whenever a flower is coming fine ; it is, to take off the end of the branch it is on, to prevent any growth beyond it, for that would weaken the flower a good deal. Besides this mode of treatment being good for the flowers coming on, it strengthens the plant for succeeding blooms. The only difference to make in case of the plant being wanted for a garden ornament, is to leave on more flower buds, but let them be all placed at equal distances.

DAHLIAS GROWN DWARF.—The Dahlia varies so much in its habit, that what would do well for one sort would be impracticable with another. The Dahlia, to be kept dwarf, should be selected of a short-jointed habit, with short footstalks to the flowers. Take the plant young, plant it at one end of the bed it is to fill, or, if a large bed, plant the proper number of dahlias at one end, or one side, and always in the lowest part, if there be any difference ; lay it into the ground sloping, and cover the root well ; then peg the stem to the ground : if there be any side-shoots already, peg them right and left of the centre or main stem, and as straight out as they can be forced without breaking. As the plants proceed, continue to peg down, and in this way cover the bed. You will find no difficulty in doing this with a little gentle coercion, using at first pegs that will hold them a little down, and by increasing the force. Cut away all that are too stubborn and cannot be laid down. When the Dahlia is well laid, the bloom does not come half the height that the plant would have grown if unconstrained, and this kind of treatment is capital on slopes or banks that want covering in the most effective manner

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THE END.

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