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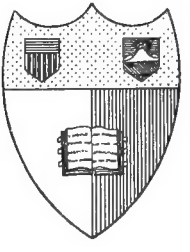

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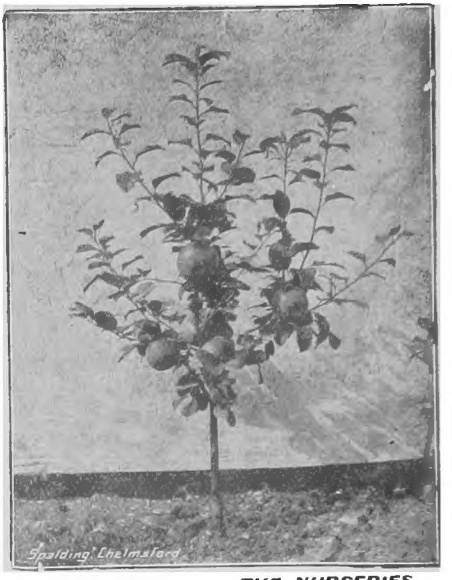

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Rational Fruit Culture.

By

H. C. Davidson.

LONDON :

"Garden Life" Press, Hatton House, Great Queen Street, W.C.

PREFACE.

A preface is, as a rule, read only by reviewers, but they turn to it first. They are aware, therefore, that its chief use is to enable authors to explain that they have been impelled to satisfy a "long-felt want." The present writer does not wish to be the exception. In one capacity or another he has had to read an immense amount of horticultural literature, much of it excellent from the technical standpoint, but nearly all characterised by what seems to him a serious fault of omission—it rarely gives reasons for the various operations described.

The object of this little book on fruit culture is to give reasons. They add to the interest of the subject, assist the memory, and stimulate thought. They may not always be right, but at least they will serve as working hypotheses, and when they do not cover any new facts which are brought to light, they can be discarded in favour of something better.

For the professional gardener who knows his work, such a book may not be necessary; it is intended mainly for the amateur who grows a few fruit trees either for his own use or for profit, and wants to understand what he is doing as well as how and when to do it.

For the excellent illustrations I have to acknowledge my indebtedness to Mrs. S. L. Osthaus.

CONTENTS

LIST OF ILLUSTRATIONS.

RATIONAL FRUIT CULTURE

CHAPTER I.

THE CONDITIONS NECESSARY FOR FERTILITY.

WHILE nearly everybody with a small patch of ground realises the importance of the proper cultivation of vegetables, there seems to be a common idea that fruit trees can take care of themselves. So Apples, Pears and Plums are bought without any regard for the suitability of the varieties chosen or of the positions which they are to occupy; they are planted in the least laborious manner; they are given little or no attention afterwards; and they are expected to bear good crops regularly. The inevitable result is disappointment. Rather late in the day, their owners set about looking for a remedy. What manure shall we apply to make them fruit, ask some? How shall we prune them to bring them into bearing, ask others? Both questions show complete ignorance of the position, for neither manuring nor, with certain reservations which will be explained later, pruning will hasten fruiting. Before buying and planting fruit trees, it is important to understand the conditions necessary for success, and a brief survey of these conditions will serve as a general introduction to the subject.

DIFFERENT CLASSES OF FRUIT TREES.

For our present purport, fruit trees may be divided into three classes—those which fail to flower, those which flower

but fail to form or to mature their fruit, and those which bear satisfactory crops. Every gardener should endeavour to ascertain and remove the cause of failure, and thus to transfer any tree in either of the two first classes into the third.

FLOWERS NOT A SIGN OF VIGOUR.

Failure to flower may be due to some condition which is merely temporary, such as unfavourable weather, or one which is more persistent, such as extreme youth. The chief thing to recognise is that flowers are not a sign of great vigour, but rather the reverse. They are formed not during the period of rapid growth, but afterwards when it is drawing to a close. In the case of annuals and biennials, the flowering season immediately precedes the end of life; in the case of herbaceous perennials, shrubs and trees, it immediately precedes the sleep of winter. It may be objected that fruit trees, like certain other plants, flower in spring. That, of course, is true; but though the flowers do not open until then, they are actually formed in the previous summer or autumn, their further development being checked by the falling temperature and only resumed when warmer weather comes again in the following year. If a so-called fruit-bud is carefully dissected in winter and examined under the microscope, the bunch of tiny flowers can be seen, complete in all their parts.

MANURE TENDS TO DELAY FLOWERING.

It follows that manure will not make an infertile tree fertile, for it consists of the material of growth, and by stimulating growth we are going the wrong way to get flowers and fruit. A weed in a garden path where it gets little food and moisture will flower long before another of the same species growing in the rich soil of the border alongside. But while the former will produce only a few small flowers, the latter will eventually have many more, and they will be much finer. It is the same with fruit trees, and hence the need of discretion. The owner of extensive grounds who can afford to wait, may

consider it worth his while to plant in rich soil in order that his trees may grow large and ultimately bear heavy crops; but the gardener to whom quick returns are important should plant in ordinary soil, using manure chiefly after the fruit is set, with the object of increasing its size.

FOOD SUPPLIES REDUCED BY GRAFTING.

Grafting is really a method of controlling the food supply. It is the natural habit of the Apple and the Pear to develop long thick roots which serve as broad conduits for the liquid food-materials collected by the root-tips, and in consequence of these lavish supplies the trees, when they are on their own roots, keep on growing for many years before they come into bearing. When they are grafted on stocks which ordinarily have fine fibrous roots, the supplies are reduced and the period before fruiting commences is very much shortened. The stock generally chosen for the Apple is the Paradise, a species of Crab, and for the Pear the Quince.

But even a grafted tree, if not treated properly, will develop long, thick roots in time, and therefore continue growing vigorously instead of fruiting. The roots follow the lines of the food around them, and as the ground close to the tree gets exhausted they travel farther and farther away, thickening as they lengthen. The addition of some manure is necessary to compensate for loss, and to keep the roots near the tree and near the surface. But the amount should always be moderate.

OLD METHODS OF CONTROLLING THE FOOD SUPPLY.

The importance of controlling the supply of food has long been recognised, but the methods formerly adopted were crude and barbarous, and had as their immediate object the reduction of the strength of the sap current chiefly by means of pressure. They consisted of tying wire tightly round the trunk, driving in enormous nails, weighting the fork with heavy

stones, cutting out rings of bark, and so forth. All these methods have been superseded by lifting at intervals or root-pruning.

LIFTING.

Lifting should be performed in the second or third year after planting. A trench is dug round the tree after the

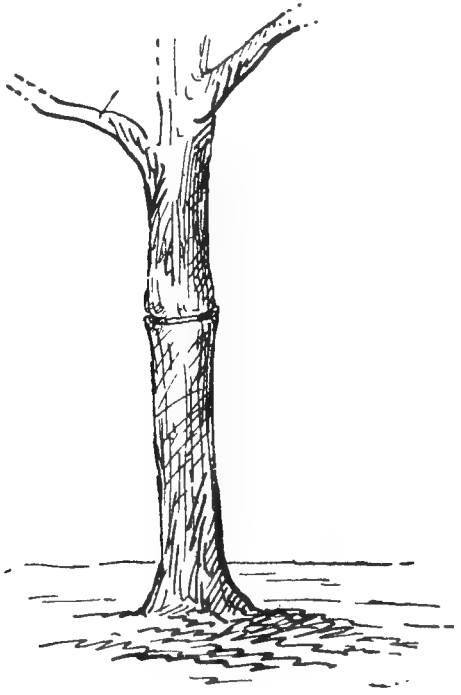

Fig. 1.—An old method of controlling the food-supply of a tree—a wire fastened tightly round it and now embedded in the bark.

leaves have fallen; any long thick roots are severed with a sharp knife or saw; and the tree, with a large ball of earth, is

raised so as to ensure that there are no taproots below. It is then replanted, and the soil is made firm again.

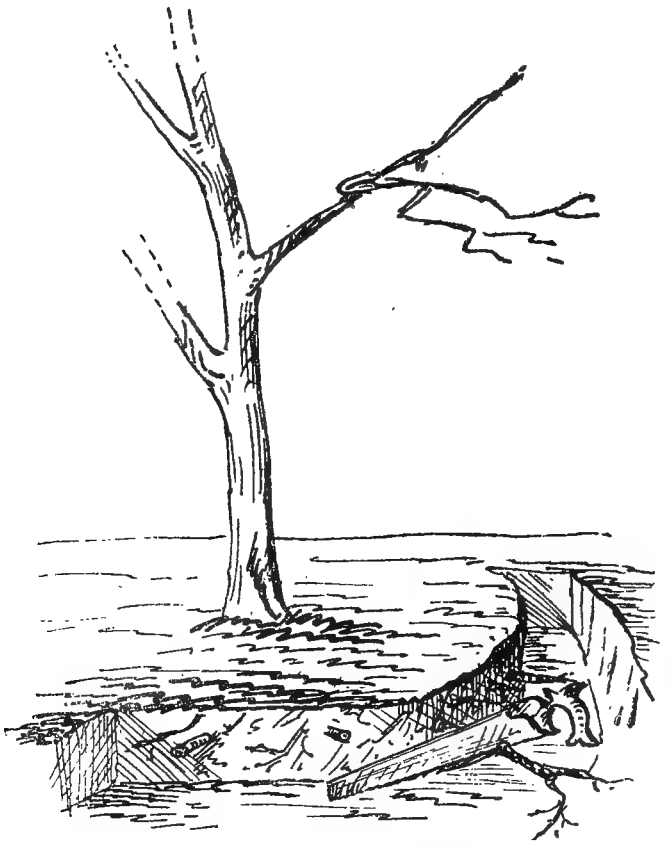

Fig. 2.—The Method of Root-Pruning.

ROOT-PRUNING.

Root-pruning is applied to larger trees which cannot be easily lifted. The principle is the same, but as a rule the cut-

ting of the roots is spread over two years, a semi-circular trench being made in the first year on one side of the tree, four or five feet from it, and all thick roots passing through it being severed, the operation being repeated on the other side in the following year. If all the roots of a large tree were cut at the same time some of the branches might not get enough food, and in consequence might die back. Root-pruning is usually performed in September or October, because the ground is then warm enough to induce the formation of some fresh roots before winter. If a tree persistently fails to flower because of its excessively vigorous growth, lifting or root-pruning is a certain remedy, though, of course, its full effect will not be seen immediately.

CHAPTER II.

WOOD-GROWTH AND FRUIT BUDS.

WE have seen that if a fruit tree is to come into bearing early in its existence its supply of food must be moderate in amount, otherwise it will keep on growing for many years and not flower until the rate of growth slackens, the artificial methods of checking growth being to graft on a stock which tends to develop fine fibrous rather than long thick roots, and afterwards to lift or root-prune.

RIPENING OF THE WOOD.

But Nature has also her own methods of control. Towards the end of a fine summer the ground dries under the influence of the sun's heat and of the reduced rainfall, and the effect is intensified by the action of the strong sunlight and fresh air on the foliage and bark. The food materials collected by the roots are, therefore, lessened in quality, and altered in quality—concentrated or thickened—conditions which favour the formation of flower-buds. This annual drying process is called ripening of the wood. If, however, a tree has been planted too deeply, or if its roots have been allowed to drop down into the subsoil, the summer drought will have comparatively little effect on it, while if it is in the shade, or surrounded closely by high trees or walls, so that the air cannot circulate freely around it, the same thing will probably happen. If Nature is to have a fair chance to help the gardener, he must do all in his power to help her—by planting at the right depth and in the right position, and by keeping the roots near the

surface. Of course, the influence of the weather cannot be entirely eliminated. A summer may be so cold and wet that the wood cannot ripen, and the formation of many flower-buds is rendered impossible, but in a well-managed orchard the effects of unfavourable weather will be much less noticeable than elsewhere.

THE EFFECT OF A HEAVY CROP.

At the same time, it would be unreasonable to expect any tree, no matter how carefully it is cultivated, to bear good crops year after year. If it does so in alternate years, its owner should be very well satisfied. The flowering of a Rhododendron or Azalea will illustrate the point clearly. If the flowers are allowed to develop seed-pods, the sap continues to pass into the pods for a long time, and in consequence no fresh growth starts on the shoots carrying them, or if it starts it does not do so until so late in the season that it cannot ripen properly, and is incapable of bearing flowers in the following year. If, however, the flowers are taken off when they wither, the sap-current, prevented from entering them, forces fresh channels for itself by starting some of the wood-buds, and this new growth, having plenty of time to ripen, flowers in due course. This will explain what happens in fruit-trees, though their manner of flowering is not quite the same. We cannot remove the withered flowers from them as we can from Rhododendrons or Azaleas; we must let the fruit develop; so heavy crops on the same tree in successive years are rare, for much of the materials which would go to the formation of new flower-buds as well as of growth, is used up in the fruit. This is a strong argument against excessive cropping. Too much fruit one year means too little the next; worse than that, it permanently weakens the trees.

HOW A TREE GROWS.

Let us see how. A fruit tree grows by additions to the outside of the wood—the cambium layer, as it is called—each

yearly addition not only covering the previous one, but also spreading beyond it and forming the new shoots. If we

Fig. 3.—Azalea shoot with young growths, as the result of the removal of the seed-pods. Inset shows the seed-pods not removed.

have an irregularly-shaped pond containing water, and pour

into it some liquid which floats on water, this additional layer will cover the former surface, and will extend further at the edges. If a still lighter liquid is added, we get a fresh covering and a further extension, and so we may go on. But, no matter what additions we make, we do not alter the layers underneath, except, perhaps, in a slight degree, by compressing them. It is the same with a tree. A ring of new wood

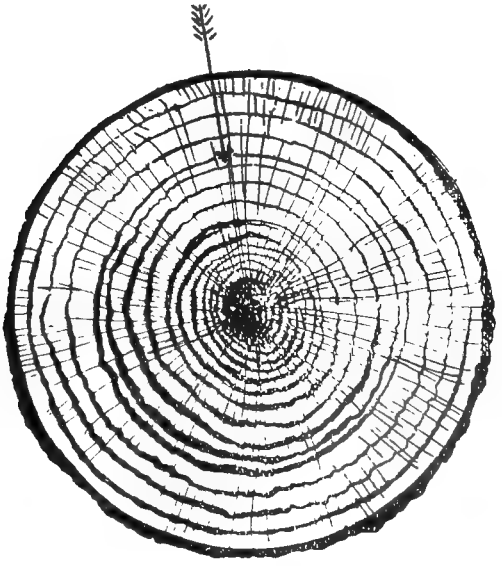

Fig. 4.—Section of a tree-trunk. The arrow points to a thin ring of wood formed in a year in which food was scarce.

is added every year—a thicker ring in a fat year, when food and water are plentiful, a thinner ring in a lean year, when they are scarce. And those rings remain practically unaltered during the life of the tree. If it has been starved in any one year either by scarcity or by the absorption of too much of its

food by the fruit, the loss is permanent. That one thin ring will always show it.

THE OBJECT OF PRUNING.

The fact that, to ensure early flowering, the growth of an excessively vigorous tree must be controlled may have suggested to some the idea that this could be done by pruning. A little consideration, however, will show that pruning—apart from root-pruning, which is a different matter—really can do nothing of the sort, for it leaves the cause untouched. If a tree has, say, seven main branches, and we cut away two, we do not lessen the amount of food materials supplied by the roots. That amount remains exactly the same. Instead of leaving it dispersed among the seven branches, we merely concentrate it in five, with the result that they grow more vigorously than ever. This is, indeed, the reason for pruning most plants—for instance, Roses. The operation does not reduce growth, but, if properly done, confines it to those parts in which it will be most useful.

FRUIT-SPURS RESULTING FROM PRUNING.

There is one method of pruning which comes in rather a different category. Most Apples and Pears flower and fruit on spurs, and if the formation of spurs can be hastened, they will be brought into bearing earlier than would otherwise have been the case. Towards the end of summer, when growth has almost ceased, the side-shoots are cut back to the fifth bud. The last three buds—the third, fourth, and fifth from the base—are left as safety-valves for the sap which is still flowing, though only weakly, and may force them to grow. The other two buds close to the base will receive so little of the sap that they will remain dormant, but will be plumped up slightly. Instead of being thin and pointed like ordinary

wood-buds, they will become rounder and thicker like fruit-buds. In autumn or winter, when the trees are leafless, the operation is completed. The part of each side-shoot carrying the three started buds is cut away; the remainder, with its

Fig. 5.—Sideshoot cut back to A in summer, and to B in winter, to form a fruit-spur.

two dormant buds, is left to form the foundation of a fruit-spur. In this way something can be done to advance fruiting, but pruning, as ordinarily performed, is useless for the purpose.

CHAPTER III.

FLOWERS, BUT NO FRUIT.

IN the first chapter, fruit trees were divided into three classes—those which fail to flower, those which flower but fail to form or to mature fruit, and those which bear satisfactory crops. The causes of failure to flower have been explained, and the methods of remedying them described. We now come to the second class.

BEES AND FRUIT.

For failure to form fruit, there may be many reasons. One of the commonest is the absence of bees. If a flower is to develop fruit, some of the yellow pollen from the ring of stamens must be conveyed at the right time to the stigma in the centre, the right time being when the latter is rather sticky. This can be done by the wind, but the best and most certain distributors are bees. They fly from flower to flower, and when they alight some of the pollen with which they are laden adheres to the stigmas with which they come in contact. The flowers are then said to be fertilised or pollinated, and, if the conditions are favourable, are capable of producing fruit. Of late years bees have been much fewer than they used to be. An enormous number of stocks have been killed by disease, and orchards have suffered in consequence.

FERTILISATION BY HAND.

Even when there are enough bees in the district, they may not do what is required of them, for they are dependent on

the weather. It is not uncommon to have a long spell of east wind in spring, and during it they do not leave their hives.

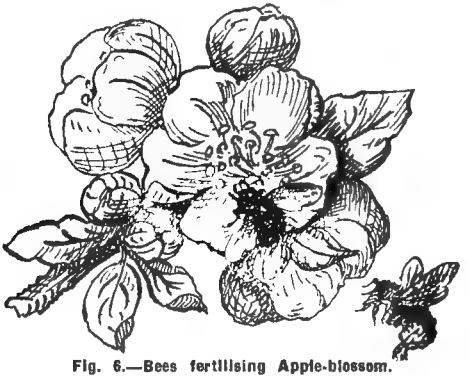

Fig. 6.—Bees fertilising Apple-blossom.

If the fruit-blossom is open at the time, most of it will probably fall unfertilised. The remedy is to fertilise by hand—

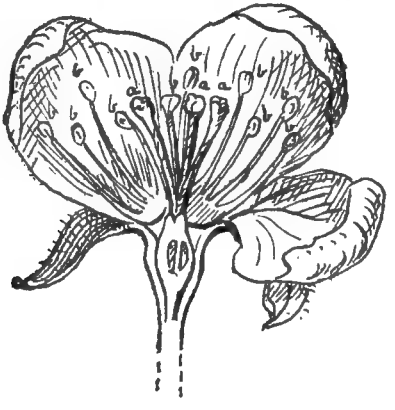

Fig. 7.—Section of Apple blossom, showing stigmas (a, a, a), and stamens (b, b, b).

to go round with a soft brush, dabbing it gently into the pollen on the stamens, and passing it over the stigmas. In an

orchard of dwarf trees, this is easily managed, and is often well worth doing. A smart boy will deal with a large number in the course of a day.

CONDITIONS NECESSARY FOR FERTILISATION.

If, however, the weather is so cold that there is actual frost, the blossoms may be destroyed, while if it is very wet or very hot the pollen may be rendered ineffective. There is a right stage for the pollen, just as there is for the stigmas. It is then said to be ripe. But if heavy rain falls at, or just before, this stage, it may be washed away or spoilt, and it cannot adhere to the stigmas if they lose their sticky secretion as the result of wet. On the other hand, strong sunshine quickly dries up the secretion and also the pollen—makes the latter over-ripe, when it loses its fresh, bright-yellow colour. For successful fertilisation, a dry, warm, but rather cloudy, morning is the most favourable time.

MYSTERIOUS FAILURES TO FRUIT.

There is a more serious and, until lately, more mysterious class of cases in which the failure to fruit is persistent. If the weather is bad, or bees are few, there will be little or no crop, but as these conditions rarely occur year after year, the failure is only intermittent or partial. There are, however, not a few trees which seldom, if ever, bear a crop. When these cases are tabulated, with the object of trying to find the reason, one fact becomes apparent—that the failures are almost invariably confined to isolated trees of certain varieties. One of them, to give an instance, is the well-known Pear, Williams' Bon Chrétien. Dozens of correspondents have written to say that they have had this Pear (and no others) for years, and have not had a crop. One of them planted between two and three dozen of this variety, and

though they have grown well and flowered, they have not fruited.

AN IMPORTANT DISCOVERY.

The multiplication of cases of this sort led various horticultural authorities, a few years ago, to commence an investigation, and as the result they announced that many varieties of fruit trees were self-sterile. In other words, they could not be fertilised by their own pollen, but required pollen to be brought to them from other varieties, which must, therefore, be fairly near and in flower at the same time. Unless these conditions were satisfied, there could be no fruit. This was a discovery of far-reaching importance, and even if it be not strictly accurate, it must have a great influence on orchard management.

SOME VARIETIES SELF-FERTILE, OTHERS SELF-STERILE.

Among those who have been investigating the matter in this country is Mr. W. J. Middlebrooke, who has published, in the "Journal of the Board of Agriculture," a report of his experiments. They extended over eight years, and his general conclusion is that no varieties of fruit trees are completely self-sterile, but that many are nearly so, and that almost all are more fertile to other pollen than they are to their own. Some of the varieties that bore very badly with their own pollen in his experiments were—among Apples, Beauty of Bath, Charles Ross, Ecklinville Seedling, Hambling's Seedling, and Ribston Pippin; among Pears, Beurré Bosc, Clapp's Favourite, Magnate, and Marie Louise; and among Plums, nearly all the Gages, such as Greengage and Late Transparent Gage. Some of those that bore well with their own pollen were—among Apples, Stirling Castle, King's Acre Bountiful, Scarlet Nonpareil, and Worcester Pearmain; among Pears, Conference, Dr. Jules Guyot, Emile d'Heyst, and Louise Bonne of Jersey; and among Plums, Blue Rock, Denniston's

Superb, and Swan, to which Victoria should certainly be added, though it does not seem to have been included in the experiments.

WHY SELF-FERTILE VARIETIES SHOULD BE PLANTED.

Every fruit-grower should carefully note the second list, containing the names of the more or less self-fertile varieties. For if only a single variety is to be grown, the selection should be made from it. Even if a number of different varieties are to be associated, some from the list should be included, because their pollen was found to have a remarkable effect on the self-sterile varieties. For instance, by fertilising the Apples—Charles Ross and Ecklinville Seedling—with the pollen of King's Acre Bountiful, the crops obtained from them were increased 400 per cent.; the crops of the Pears, Clapp's Favourite and Marie Louise, were enormously improved by means of the pollen of Louise Bonne of Jersey; and so were the crops of the Gages by means of the pollen of Denniston's Superb, though even then they were not so prolific as most other Plums. Hence it is important to select self-fertile varieties, not only that they may bear well themselves, but also that they may influence other varieties growing round them.

CHAPTER IV.

THE ARRANGEMENT OF FRUIT TREES.

THE fact that, as shown in the last chapter, many varieties of fruit trees are more or less self-sterile, affects the owner of a small plot more than the large grower. He may not have space for more than, say, three trees, and if they are to be an Apple, a Pear, and a Plum, he should select a self-fertile variety of each, or else he should procure, grafted on the same stock, two varieties which flower about the same time, and are capable of fertilising one another.

TWO VARIETIES ON THE SAME STOCK.

In old gardens trees doubly grafted in this way are not uncommon. They may have been operated on by some enthusiast who was anxious to prove his skill, or he may have wanted merely to add some other variety to those he already had; certainly at that time there was no suspicion of the fact which has since been discovered; but as such trees generally bear well, it is curious that nobody seems to have been induced to try to find out the reason. A year or two ago it would have been difficult to buy trees of the sort, but there is now sure to be an increasing demand for them, and nurserymen will not be slow to satisfy it.

MANY VARIETIES OR FEW?

Of course, the gardener who grows fruit for profit will have more than two or three trees, and if they are not all of the same self-sterile variety, he may have no trouble about their fertilisation. There is an advantage in not having many different varieties—large lots, maturing at the same time, are

more inexpensively gathered and marketed than small ones, and are, as a rule, more readily saleable; but the disadvantages are considerable. Unless the varieties are rightly chosen they may not fertilise one another; flowering simultaneously, they may all have their crops destroyed by a single night's frost, or by two or three days' unfavourable weather; and the owner of fruit which must all be sold at once, has less opportunity of taking advantage of a rise in price than another who has fruit coming into season at different times. In this connection, it may be mentioned that it is very early or very late fruit which is the most profitable.

TREES SHOULD NOT BE FAR APART.

Important though it is to select the right varieties and to have a sufficient number of them, another condition is necessary to ensure success. They must not be planted far apart. The wind may scatter the pollen widely, it is true, but this is mere chance. In any case, unless the wind changes its direction, the pollen from any one tree will be dispersed only on one side of it, and those on the other sides will get none from it.

CLOSE PLANTING AIDS BEES.

Bees, again, do not travel far from their hives unless the weather happens to be warm and sunny, and the farther the trees are apart the fewer cross-journeys the bees are likely to make. In the "Journal of the Victorian Agricultural Department," it is stated that the yield of a large field of Cranberries was found to be greatest near the hives, lessening as the distance increased. This was only what might have been expected. The smaller the amount of unproductive work the bees have to perform—in travelling to and fro—the more time they will have for doing what is useful.

THE SAME VARIETY IN LARGE BLOCKS.

The same thing applies to fertilisation by hand. If the varieties which are to be cross-fertilised are far apart, the task is rendered much more laborious by the necessity of passing backwards and forwards from one to another, while it is less likely to be properly done. In some orchards each variety is planted in a large block, with the result that the trees on the outside of each block generally bear heavier and more regular crops than those in the middle, the reason being that they get more of the pollen from the other varieties around them.

HOW TO INTERSPERSE DIFFERENT VARIETIES.

Obviously, then, the best method of arrangement is to keep together the varieties likely to fertilise one another—those which flower at the same time—and to intersperse them. For instance, if we have six of the self-fertile Apple, King's Acre Bountiful, and three each of the more or less self-sterile varieties, Charles Ross and Ecklinville Seedling, which yield much larger crops when fertilised by it, we might arrange them thus:—

K.A.B.	C.R.	K.A.B.	E.S.
C.R.	K.A.B.	E.S.	K.A.B.
K.A.B.	E.S.	K.A.B.	C.R.

Similarly, if we had eight trees of the self-fertile Pear, Louise Bonne of Jersey, and two each of the more or less self-sterile varieties, Clapp's Favourite and Marie Louise, and also four of Doyenné du Comice, which, like them, has its crops greatly increased by the pollen of Louise Bonne of Jersey, we might arrange them thus:—

D.C.	L.B.	D.C	L.B.
L.B.	M.L.	L.B.	M.L.
C.F.	L.B.	C.F.	L.B.
L.B.	D.C.	L.B.	D.C.

Of course, these are merely suggestions. But they will show how to arrange different varieties so as to have the best chance of successful cross-fertilisation by the wind or by bees, or to reduce the labour when it is done by hand.

RISKS AFTER THE FRUIT IS SET.

The blossoms wither and drop soon after they are fertilised, and the tiny fruit which is then said to be "set," begins to swell. The first stage on the road has been accomplished, but the grower has still many risks to run. Strong winds may bring the fruit to the ground; insects or fungoid diseases may completely spoil it; a hot, dry summer may prevent the greater part of it from growing to a suitable size. Over some of these conditions it is difficult to exercise much control. Hoeing will check evaporation from the ground, and so will a mulch of manure laid round the trees, but, except in cases of comparatively recent planting, it is rarely possible to give enough water to reach the roots. The harm done by the wind is very liable to be exaggerated. Unless the crops are systematically thinned, they are often heavier than the trees should be allowed to mature, and the loss of some fruit may be a blessing in disguise. This is Nature's method of thinning—rather an indiscriminate method, it must be admitted, and sometimes much too drastic.

CHAPTER V.

THE PURCHASE OF TREES AND PREPARATION OF THE GROUND.

NOW that we know the conditions under which fruit is formed, we are in a position to choose the best varieties—those most suitable for our purpose—and to prepare for the planting of them. As we have seen, they should be self-fertile varieties, or, if more or less self-sterile, should be associated with others capable of fertilising them; they should preferably be dwarf bushes; they should be well-grafted and well-grown; they should be provided with plenty of fine fibrous roots; they should be obtained from a trustworthy firm, and a fair price should be paid for them.

THE PRICE OF FRUIT TREES.

The matter of price is important. If it is very low, it means that the trees are young—probably "maidens," that is, only one year grafted—in which case three or four years at least must elapse before they bear a crop; or that very little labour has been spent on them, with the result that they are badly grown, and, in consequence of not having been lifted, badly rooted. Whether a plant, not a very new or rare one, is raised from seed or by grafting, budding, layering, or cutting, the initial cost is, as a rule, the merest trifle; it is mainly the labour spent on its cultivation that regulates the price. If the labour has been small—if, in other words, the plants have been neglected—they can be sold for very little, and almost certainly will be worth very little. We may take Wallflowers, as an instance. If they are to stand the winter

well they should be hard-wooded and short-jointed; they should, therefore, be transplanted once or twice to prevent their making tap-roots. This necessitates raising the price. But even then they will be cheap, as compared with others which are nearly sure to be injured or killed by frost, because, never having been moved, they have long, soft, sappy shoots. Similarly in the case of fruit trees, the additional money which must be paid for good specimens is not wasted. They begin to bear much sooner than so-called cheap trees, carry heavier crops, and give much less trouble.

TREES BOUGHT AT SALE-ROOMS.

Before passing from the question of price, it may be advisable to say something about auctions. Fruit trees are sent every year in enormous quantities to sale-rooms, and are there generally sold at a lower rate than they can be bought from a nursery. But, unless the buyer is an expert, the chance of getting a bargain is not much greater than that of drawing a prize in a lottery. The auctioneer accepts no responsibility for the trees he offers. He could not do so, for they come from different parts of the country, and often from different countries. They may not be true to the names with which they are labelled; they may be very poor specimens; they may be, and often are, in deplorable condition, thoroughly dried up as the result of their long journey. In any case, the purchaser has no redress; he takes them entirely at his own risk. The amateur had better, therefore, leave them alone. If a nurseryman with a reputation to maintain buys them, he is careful, before selling them again, to test them in his grounds, necessarily adding to the price for so doing. Unfortunately, there are some firms that are less scrupulous, their object in buying being merely to sell again immediately at a profit. Hence the importance of dealing only with a firm that can be trusted.

THE SITE FOR AN ORCHARD.

Before the trees arrive from the nursery the ground should be prepared for them. The site should be sunny, open, but not excessively exposed. Fresh air is, as we have seen, necessary for the ripening of the wood, and also for the colouring of the fruit, but if the site is swept by strong winds the trees may be broken, or much of the fruit may be blown down and spoilt. Sometimes, however, there is no alternative; and, if an orchard must be in a bleak position, a screen of tall, fast-growing trees, such as Poplars, should be planted on the side from which the prevalent winds come.

THE MOST SUITABLE SOIL.

The most suitable soil is good, porous loam. If it is very light, it requires great quantites of manure to keep it in good condition, and this involves much labour and expense; if it is very heavy, growth is slow, ripening of the wood is interfered with, and disease is often troublesome. Wet land must be drained. This should be done by putting in field drains, though, in less serious cases, it may be sufficient to place a layer of stones, or broken bricks, at the bottom of the holes prepared for the trees. Stone-fruits, such as Plums and Cherries, require lime; so, for them, if the soil is deficient in lime, old mortar, or chalk, should be substituted for the stones or broken bricks.

SAND AND CLAY.

It would be impossible to emphasise too strongly the necessity of drainage. Apart from organic matter, resulting from the decomposition of vegetation, manures, and so forth, the principal constituents of soil are sand and clay. They differ from one another chemically, but that, as far as plants are concerned, is of no importance, for as neither is soluble in water, their chemical composition cannot affect growth. But

they also differ physically—in the size of their particles, those of clay being much smaller, and therefore fitting more closely together than those of sand—and for this reason their effects differ considerably. When soil consists of not less than 80 per cent. of clay, the rest being sand, it is called clay; when the proportion of clay falls to from 60 to 80 per cent., it is

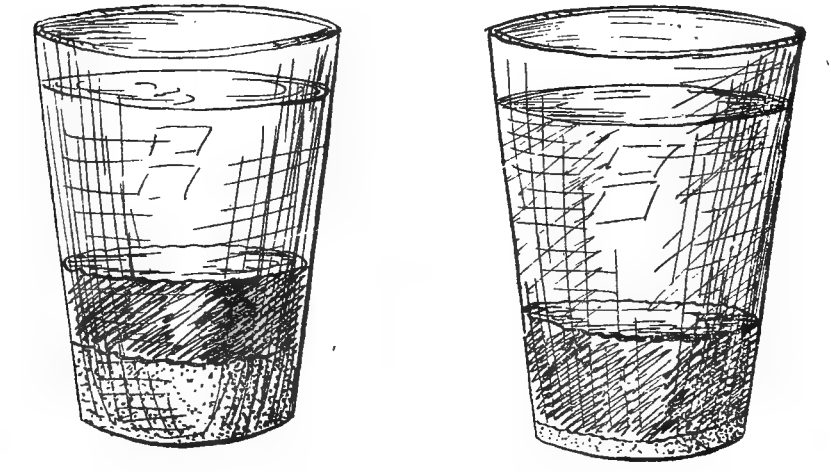

Fig. 8.—Glasses of water, with samples of soil. On the left nearly equal proportions of sand and clay; on the right mostly clay.

clay-loam; when the proportion falls still more, to from 40 to 60 per cent., it is loam; with only 20 to 40 per cent. of clay, it is sandy loam; and with less than 20 per cent. of clay, it is sand. If a handful of soil is mixed with water, shaken up well, and allowed to settle, the particles of sand will sink to the bottom, and then the smaller particles of clay will form a layer on top. In this way, their relative proportions can be determined.

WHY HEAVY LAND MUST BE DRAINED.

When soil is in good condition the particles are surrounded by a film of moisture, and the spaces between them are filled with air. The air is essential to the roots of plants. They cannot grow without it any more than the shoots or branches can grow without it. As the particles of sand are larger than the particles of clay, the spaces between them are also larger, and contain more air. If, therefore, food is plentiful, growth is more rapid in sandy soil, especially as the root-tips can penetrate the larger spaces more easily than those between the more closely-packed particles of clay. If, however, the soil is very wet, the spaces which should contain air are filled with water instead, and, in consequence, the growth of the roots is checked. And, unless the injurious condition is soon remedied, they begin to decay. This is more likely to happen in clay than in sandy soil. For the larger spaces in the latter let the water drain away more quickly than in the former. In other words, clay retains moisture much longer than sand. Also, when once dry, it is much more difficult to moisten thoroughly. If, therefore, fruit trees are to have a fair chance in heavy land, it must be well drained. It should also be lightened by the admixture of road-scrapings, or some other kind of grit, together with a moderate amount of manure. Lime is a useful dressing as it disintegrates clay.

CHAPTER VI.

WHEN AND HOW TO PLANT.

THE best time to plant fruit trees is early in November, as soon as possible after the leaves fall. As the ground is then warmer than the air, some new roots may be made before winter, while, the sap having ceased to flow, the trees are at rest, and have no longer to carry on the vital functions connected with growth, so that the disturbance has no injurious effect on them.

WHY TREES SHOULD BE PLANTED WHEN LEAFLESS.

It is true that, for some weeks before the leaves fall, the sap has ceased to flow, but there is a serious objection to doing anything that would bring them down prematurely

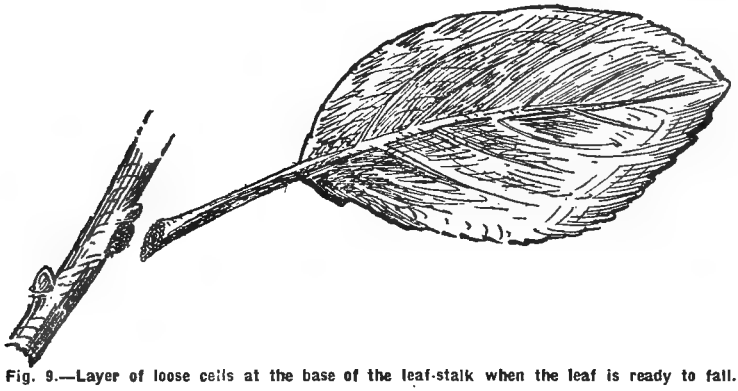

Fig. 9.—Layer of loose cells at the base of the leaf-stalk when the leaf is ready to fall.

or interfere with the natural process of withering. The yellowing in autumn is due, not to the actual destruction of the green colouring matter, but to the fact that it, or part of

it, is gradually withdrawn from the leaves as the result of the lowering temperature. It recedes down the petioles, or leaf-stalks, into the buds or twigs, and there it remains ready for use in the following spring. This valuable material would be lost to the trees if they were lifted too soon. There is another reason for waiting for the leaves to fall at their own time. As the sap recedes from them, a corky layer of cells is deposited at the base of each stalk, between it and the twig out of which it grows, with the result that, when the loosened leaf breaks off, there is already a kind of scab covering the wound. This is a very important provision of Nature. For disease germs cannot, as a rule, penetrate sound and healthy bark; they can gain entrance only at the wound.

LATE PLANTING.

There may be cases in which November planting is impossible. It must then be done later. It may be done as late as March. It is best to avoid mid-winter, unless the weather happens to be unusually mild. If trees come from the nursery during hard frost, they should be placed in a shed until the conditions are more favourable, care being taken that the packing material round the roots does not get dangerously dry.

DISTANCES TO PLANT.

The usual distances for planting are from eight to ten feet for bushes, from ten to twelve feet for pyramids, and eighteen feet, or rather more, for standards.

A bush is a small tree with a number of more or less upright branches issuing from points not very far from the base; a standard may be regarded as a bush on the top of a single, tall stem, on which it is grafted; a pyramid, as the name suggests, has a single, central stem, with side-branches around it, lessening in size as they get nearer the top. The last, growing taller than a bush, needs rather more space,

but less than a standard. Of course, for some years the trees will not occupy all the ground allotted to them, and during that period Currants and Gooseberries can be grown between the rows. If the plantation of small fruit is intended to be permanent, a not uncommon practice in market gardens, the distances given above should be increased. In this connection there is one point which should be borne in mind. The heavier the land is cropped, the greater the amount of food taken out of it, and consequently the greater the amount of manure in some form or other which shall be applied to make good the loss.

SPREADING OUT THE ROOTS.

The excavation for each tree should be large enough to hold all the roots when spread out evenly all round. According to a report issued by the Woburn Experimental Farm, it would seem to be of very little importance how planting is done, so long as the soil is brought into close contact with the roots by means of ramming, but the grower who wishes to take the fewest risks will adopt those methods which make the strongest appeal to his reasoning faculties. Let us suppose, then, that close contact with the soil is the one condition necessary for successful planting. If the roots are bunched together in a small hole, it will be almost impossible for the soil to reach and enclose each and all of them, and such growth as they are able to make will be only on the outside. If, on the other hand, the roots are spread out separately, near the surface, not only will they tend to grow at that level, and to keep within the influence of the sunlight and air, but also they will all be completely surrounded by soil. It should be rammed firmly down upon them for two reasons—firstly, in order that its moisture should induce the growth of young roots as soon as possible, and, secondly, to prevent any movement which might break them. Loose,

spongy soil is liable to contain an excessive amount of moisture, and tends to cause soft, sappy growth.

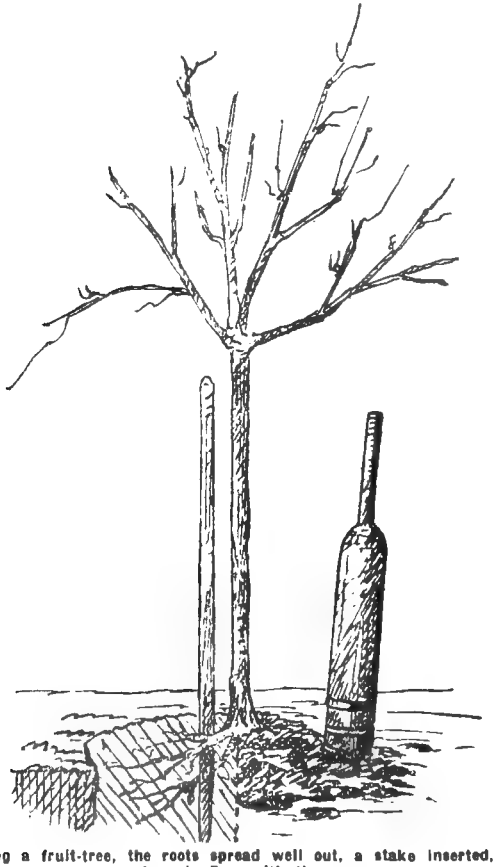

Fig. 10.—Planting a fruit-tree, the roots spread well out, a stake inserted, and finally the ground made firm with the rammer.

THE EFFECT OF GRASS ON TREE ROOTS.

The experiments at Woburn seem to establish one fact which is important—that it is a mistake to plant in grass.

Apparently, the grass, during its growth, secretes some poison which affects other plants near. The poison is not permanent; it decomposes in time, and is then converted into a plant-food, which is one reason why old, dead turf is so admirably adapted for mixing with potting soil; but it continues to be secreted so long as the grass remains alive. It may be objected that there are many grass orchards in the country, and that the trees in some of them have reached a large size, and look very healthy. But we do not know the conditions under which they were planted. It was many years ago. There may not have been grass around them then, and, even if there was, its effects might not now be visible. In any case the trees are so large that their roots must long have passed out of the upper layer of soil, and the grass can have little direct influence on them.

But apart from the question of a poisonous secretion, grass would consume much of the food which would otherwise be available for the trees, while it would afford shelter for many hurtful insects. It is, therefore, much wiser to plant in arable land—land which has been ploughed or dug, and which can be continued to be cultivated, and, when necessary, manured, with the assurance that the trees will derive the whole benefit. If the proposed site for the orchard is at present meadow, and there is any good reason for not breaking it all up, the square cleared for each tree should be as large as possible, in order that the roots may not be likely to reach the turf for some years.

THE DEPTH TO PLANT.

The depth of planting should be the same as it was in the nursery. This can easily be seen by the soil-mark round the base of the stem. It should not be deeper, because the roots would then be too far away from the surface, and growth would be interfered with; it should not be shallower, because

the trees would not have sufficient hold of the ground, and would be liable to be blown down. Of course, if a layer of broken bricks or mortar is to be thrown in, allowance must be made for it when digging the hole. If some garden refuse is placed over the bricks, it will prevent the soil from filling up the spaces between them, and, when it decays, will provide food. When the soil is heavy, a quantity of road-scrapings will be useful for mixing with it, and for placing immediately over the roots. If manure is used, it should be moderate in amount, thoroughly decomposed, and not in contact with the roots. But, unless the land is poor, it is better applied as a top-dressing, so as to induce root-growth near the surface.

DAMAGED ROOTS.

It sometimes happens that when trees arrive from the nursery, some of the roots are found to be injured. During the process of lifting they have been scraped, or pierced by the fork, or they have been split or torn asunder, or they have been bruised in transit. Before planting, all such wounds should be trimmed off cleanly with a sharp knife. If they are allowed to remain they are sure to give rise to suckers.

WHY WOUNDS CAUSE SUCKERS.

Let us see why. When a plant is injured, sap exudes at the wound, and, in dry air, forms a protective covering or scab. If two wounded surfaces are brought into contact, so that the air cannot enter, and are prevented from moving, the sap forms in time a firm connection between them, as in budding and grafting. If the wound is kept moist, as in the case of a cutting or a layer, by surrounding it with damp soil, or, as in the case of some hard-wooded plants which do not readily decay, by placing it in water, the sap does not harden, as it does under the drying influence of the air, but forms a mass of soft cells called a callus, which presently

develops roots. This is what happens when a tree is planted with an injured root. First a callus at the wound, then a bud and a little cluster of thread-like roots, and, finally, a shoot or sucker.

THE HARM DONE BY SUCKERS.

As fruit trees are always grafted, a sucker, growing from the roots or below the graft, necessarily belongs to the same species as the stock—Paradise or Quince, or whatever it may be—and is, therefore, useless. Indeed, it is worse than useless. Situated on one of the main lines along which the tree draws its food supplies, it is able to intercept them, and, growing rapidly in consequence, it weakens the tree, and, in time, may even starve it to death. Every sucker should, therefore, be completely removed as soon as it is noticed.

HOW TO GET RID OF SUCKERS.

Nothing can be gained by chopping off the top. For

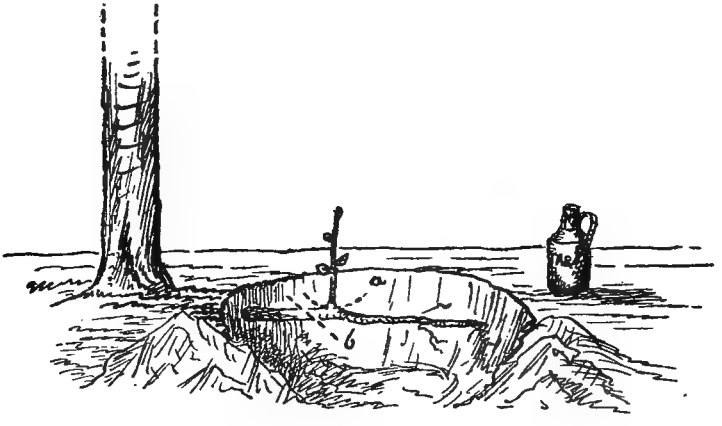

Fig. 11.—Removing a sucker. Either as shown at a, or by severing the root as at b.

the buds below the surface will then grow, and in a short time there will be a number of shoots where previously there

was only one. The root should be laid bare, and the whole of the sucker should be cut away. If a spot of tar, or a styptic such as is used to prevent the bleeding of vines, is applied to the wound, it will lessen the chance of any fresh growth at that point. In very bad cases, where groups of suckers are growing up around neglected trees, it may be necessary to sever some of the main roots as in ordinary root-pruning, and to drag up the ends with the suckers attached.

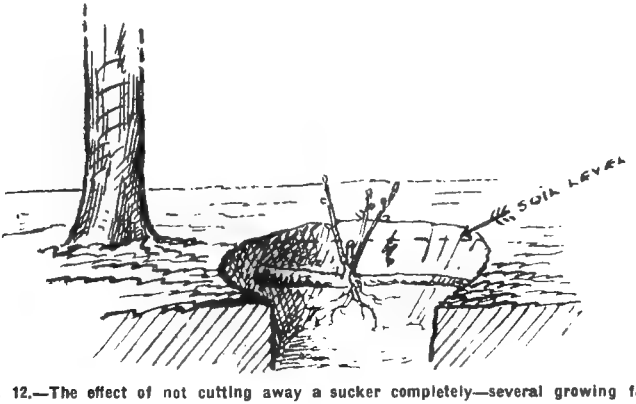

Fig. 12.—The effect of not cutting away a sucker completely—several growing from the stump.

But prevention is better than cure; and if the roots are sound when a tree is planted, and if they are not afterwards injured by the careless use of the fork or spade, it is unlikely that there will be much trouble from this cause. A root may, as it swells, come in contact with a sharp stone, which eventually penetrates it, and thus starts a sucker, but this does not happen often.

WHEN TO STAKE FRUIT TREES.

There is one precaution which should be taken—to stake all trees which require staking before the holes are filled up. It is easy to avoid the roots when they can be seen, but

impossible after they are covered with soil. Bushes and small pyramids rarely need supports, but for standards they are essential. The young roots are exceedingly brittle, and if there is any swaying which causes them to move they are almost sure to be broken.

HOW TO STAKE THEM.

The stakes should be strong, smooth, straight, and pointed at the lower end. If this end is dipped in some preservative they will last much longer. If they are crooked they are very liable to damage the trees, because of the difficulty of preventing contact at some point or other. They should be driven into the ground on the side from which the prevalent wind comes. In some cases it may be advisable to have two stakes

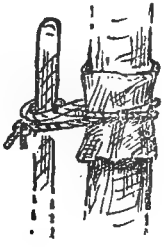

Fig. 13.—Tying a fruit tree—the cord crossed between it and the stake to keep the two apart.

to a tree—on opposite sides of it. The best tying material is tarred string, which can be obtained from any horticultural firm. To prevent the tree from being cut by the stake, or from fraying against it, a narrow band of hay or sacking should be put round it. The string should then be tied round the band firmly, but not so tightly as to interfere with the circulation of the sap, and should be passed round the stake and made secure. If it is crossed between the tree and the stake, it will help to keep the two apart.

FINISHING PLANTING.

The holes can now be filled in. This should be done by laying about half the soil over the roots and treading it down, and then dealing with the remaining half in the same way. If a rammer, a long block of wood with an upright handle in the centre, is available, it may be used to finish the work. Of course, the amount of ramming should depend on the nature and condition of the soil. If it is very heavy and very wet, and has not been mixed with plenty of grit to lighten it, much ramming would make it as solid as stone. At this season there is no need to water. It is, however, a good plan to dip the roots in water, or to spray them thoroughly just before planting, as this causes the soil to adhere to them. Finally, if a mulch of manure is laid around each tree, it will lessen the chance of the ground being frozen hard during the winter.

CHAPTER VII.

PRUNING FRUIT TREES.

THE question whether fruit trees should be pruned in the season in which they are planted—before they begin to grow in their new positions—is one which has been answered differently by different authorities. In order to throw some light on it, a series of experiments with Apples was planned two or three years ago, and carried out at the Royal Horticultural Society's Gardens at Wisley. The general conclusion arrived at was that "all Apples grow better in the first season, if they are pruned in the season of planting, than if they are left unpruned, and that the check imposed by neglect of pruning is felt by trees on the Paradise stock for at least three years after planting, while trees on the Crab stock appear to recover more quickly." The advantage of immediate pruning is what reason would lead us to expect. When a tree is moved it has to make a fresh start with fresh roots, and as these fresh roots must at first provide a smaller quantity of food materials than before the disturbance, the various branches, unless they are reduced in number or in length, must get an insufficient supply. It follows that Apples and Pears should be pruned soon after they are planted—at any rate, before the following March.

THE OBJECT OF PRUNING.

But before the knife is taken in hand, it is necessary to understand clearly the object to be kept in view. If there is any doubt, it is far better to leave the trees alone. They are easily spoiled by reckless cutting, whereas they will, in

time, rid themselves of some of their superfluous wood. For Nature is quite capable of doing her own pruning. If a branch allows itself to be so heavily overshadowed by others above it that its usefulness is impaired, she gradually kills it; if two branches are so badly placed that they fray against one another, she eventually severs them at the point of contact; if they get densely crowded, she destroys some and so thins them out. The work is done, but very slowly and very wastefully. There is, so to speak, a perpetual struggle between the different parts of a tree for the food materials provided by the roots, and also for light and air, and even those parts that come off winners are starved, to some extent, by having to share with the losers who can give nothing in return, for their fate is sealed. It is the gardener's duty to assist Nature by anticipating her in this work—to do it more quickly, more economically, and more thoroughly. He should, therefore, aim at producing and maintaining what are called "well-balanced" trees—that is, trees with the branches arranged symmetrically around them, so that each may have as much space as possible—and should cut away all wood that is either useless itself, or likely to interfere with the usefulness of other wood better adapted for fruit-bearing.

THE BEST FORM OF BUSH.

Let us consider the Bush Apple or Pear first. The best form is not unlike a well-pruned Red Currant, but, of course, larger. It consists of six or seven strong, upright, or nearly upright, branches, well apart from one another. In winter it has no side-shoots. They are cut back in July, as previously described, to about five buds, and, after the leaves fall, are further shortened to two, in order to convert them into fruit-spurs. If there are more side-shoots than are required for the purpose, or if any are unsuitable, they are pruned off completely. It will be seen that this form of tree is really

an espalier, with the branches upright instead of horizontal. It has many advantages over other forms. Though the reduction of the amount of bearing wood by the removal of all side-shoots necessarily means a reduction in the cropping capacity, the fruit is, for that reason, much finer; being fully exposed to the sunlight and air, it is also superior in flavour and colour; hanging close to upright branches, instead of swinging from horizontal ones, it is less liable to be shaken down by the wind; and it is more easily gathered.

HOW TO PRUNE A BUSH APPLE, OR PEAR.

When young trees are obtained from a nursery, they are sure to have too few main branches or stems, while some will probably be too weak or badly placed. The latter should first be cut away; the others should then be shortened sufficiently to cause some of the buds near the base to break in spring. The shortening should always be to a bud pointing outwards, so that the growth may be away from the centre, and the cut should slant slightly back from the bud to the opposite side of the branch. There is then no snag or end of dead wood left, an important matter, for snags are wide-open doors for insects or disease germs. At the same time, any side-shoots not suitable for growing on into main stems should be cut back. If the result of pruning is that a tree is left with, say, three shortened main stems, and if each of them branches into two in the following season, the framework of a bush, with six stems, is then formed, and all that remains to be done in subsequent years, is to prune back any side-shoots to make fruit-spurs. If more than the required number of stems grow, the best should be selected and the others cut away.

HOW TO PRUNE A STANDARD.

A standard is, as previously stated, really a bush on the top of a tall stem. It should, therefore, be pruned in exactly

the same way as a bush. Any shoots issuing from the stem itself—below the graft—must be regarded as suckers, and should be taken off. Indeed, they should not be allowed to grow, but should be cut away as soon as they are noticed.

Fig. 14.—A Bush Fruit Tree Pruned.

HOW TO PRUNE A PYRAMID.

As a pyramid Apple or Pear consists of a central stem, with branches round it, the management of the stem is the first thing to be considered. It may be left at full length

if the branches are satisfactory, but, if they are insufficient in number or badly placed, so that some have to be cut back severely, it should be shortened, in order to turn the sap into them and make them grow and thicken. A new shoot will then start upwards, close to the point at which the stem was shortened, and will take the place of the part cut off. In

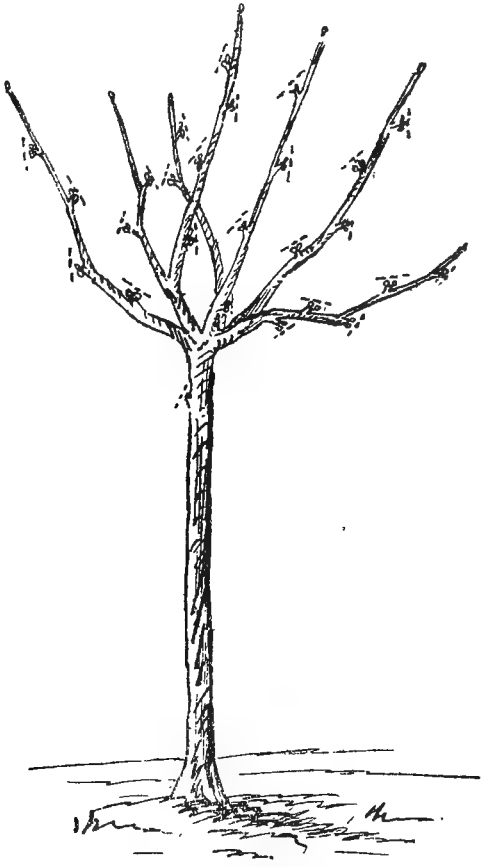

Fig. 15.—A Standard Pruned.

other words, it will become what is called the new "leader." It should be treated in the same way as the original leader.

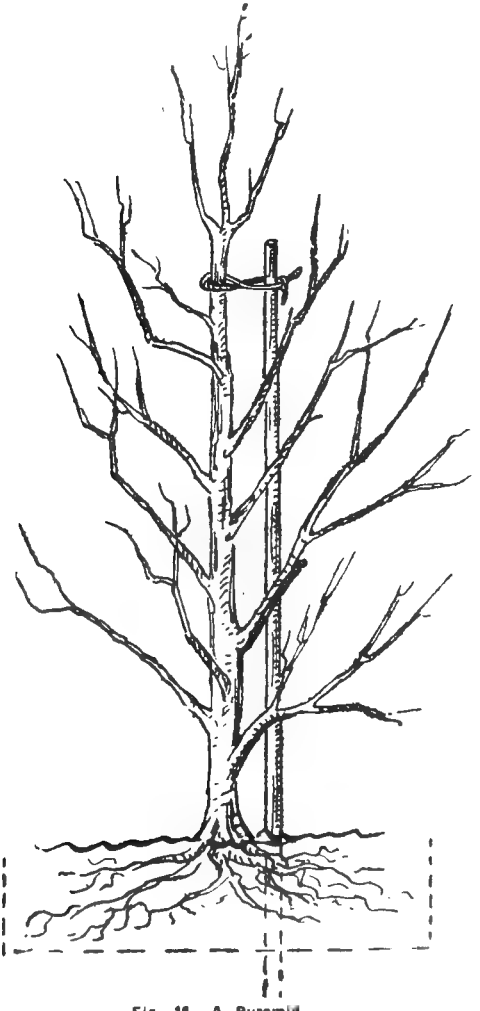

Fig. 16.—A Pyramid

It should be allowed to extend upwards unchecked, if the branches grow satisfactorily, but if they do not, it should be shortened in its turn. Some side-shoots may be allowed to grow on the branches, the others being cut back to form spurs, or all of them may be so cut back.

THE PRUNING OF PLUMS AND CHERRIES.

It will have been observed that in the foregoing directions only Apples and Pears are mentioned. The less Plums and Cherries are pruned the better. It may be necessary when they are planted, to shorten them, thin them, or cut away certain shoots, and sometimes even to repeat the operation in subsequent years; but, as a rule, they are not improved by much pruning, and it renders them more susceptible to disease. It would hardly be practicable to protect every small wound, but, in order to prevent the entrance of insects and disease germs, tar should be applied to all large wounds, those made with a saw. The cut should be smooth, and never horizontal, always sloping, so that water may not lie on the surface.

CORDONS AND ESPALIERS.

Two other forms of trees remain to be dealt with, the cordon and the espalier. The ordinary cordon has two horizontal branches, one on each side of the stem, about two feet from the ground. The stem is stopped just above these branches, which are trained out at full length, and allowed to extend as far as they will, or as far as there is room for them, all side-shoots being cut back to spurs in the manner described under bushes. This form of cordon is often grown around the plots in the kitchen gardens, and is excellent for the purpose, for it occupies very little space, and does not intercept the sunshine. Another form—with vertical, instead of horizontal branches—is sometimes grown against walls. If

allowance is made for this slight difference, it should be treated in the same way.

The espalier is really a cordon, with more than one pair of horizontal branches, arranged one above the other. The lowest pair is grown first as if the tree were to be an ordinary cordon. But when it has developed sufficiently, a leader is

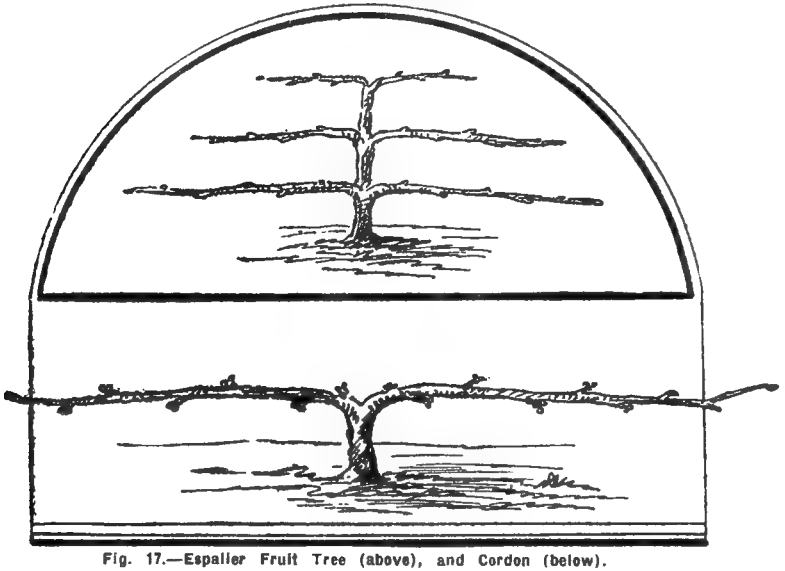

Fig. 17.—Espalier Fruit Tree (above), and Cordon (below).

allowed to grow, and, when a second pair of branches can be obtained from it, it is stopped, in order to divert the sap into them. Afterwards, if desired, a third pair can be formed in the same way, and so, in time, a tree of many pairs can be built up.

It will be seen that in espaliers, and especially in cordons, the amount of bearing wood is kept at the lowest limit. The result is, that though the quantity of the fruit is reduced, the quality is exceptionally fine.

CHAPTER VIII.

THE CULTIVATION OF THE SOIL.

THE management of fruit trees, after they are planted, consists in regulating the growth by means of pruning, keeping the soil in good condition, and waging war against insect and fungoid pests. The general principles of pruning having been described, we now come to the cultivation of the soil.

THE HARM DONE BY WEEDS.

It must, of course, be kept free from weeds by means of hoeing and digging. If allowed to grow, they consume much of the food which should be available for the trees, just as the sparrows which abound in a poultry-yard consume much of the food intended for the fowls; they harbour injurious insects; they shut out light and air from the ground. They should, therefore, be destroyed while they are young, before they are able to do much harm—certainly before they begin to seed. The hoe is an admirable implement for the purpose. But it must be properly used—in such a way as to cut through the weeds, as well as to leave them lying on the surface, and on a fine day, preferably in the morning, when they will quickly die. Not infrequently they are left uncut in the soil, and, after the next shower, they are as lively as ever. The whole work has then to be done over again.

THE USES OF THE HOE.

The hoe is useful in other ways. It keeps insects on the move, exposes them to birds, and so reduces their number; it lets into the ground the air which is necessary for the growth

of the roots; and it retains the moisture in the soil. In some districts of South Africa, where there are extensive orchards, rain does not fall for many months, and vegetation is liable to be scorched up, yet by means of frequent hoeing—"dry farming," it is called—the trees are enabled to grow well and to bear heavy crops. In this country we have much less to fear from drought, but even here it sometimes produces disastrous effects, especially in light land. When the soil is left undisturbed for a time, the particles settle together in a compact mass, intersected by innumerable tiny channels which communicate with the surface. It is through these channels that, in dry weather, the moisture escapes into the air. By means of the hoe, they are broken up, and the loose layer of soil which is formed on the surface greatly reduces the loss. These are the ideal conditions for growth—a firm layer for the roots to develop in, and a loose layer above them.

AUTUMN DIGGING.

In autumn or winter the land may be forked over. But care is needed near the trees, otherwise the roots will be injured, and suckers will be the result. The digging should there be confined to a mere pricking of the surface. It is safest to dig from each tree, not towards it, and especially not across the lines likely to be followed by the roots. There is then much less chance of damaging them.

The question whether manure of any kind is wanted must be decided by observation of the trees. They cannot be expected to make very much growth in their first year, because they have to form a new root-system—to become established is the term often employed—before they do so. Afterwards, if they grow satisfactorily, they obviously have as much food as they require, and to give them more before they have used up what they have would delay flowering and fruiting. On

the other hand, if there is nothing wrong with the cultural conditions, such as the drainage, thin and scanty growth may be regarded as a sure sign that they want something which they cannot find in the ground. But what ?

THE INGREDIENTS IN PLANT FOOD.

There are three principal ingredients in plant-food—phosphate, nitrate, and potash. All three occur in stable manure, but as they are not in the right proportions, there is necessarily some waste. For if a plant has consumed, say, all the phosphate and all the nitrate, together with as much of the potash as it needs to accompany them, and there is some potash left over, the surplus cannot be used until more phosphate and nitrate are added. Hence the advantage of artificials. We can mix them with stable manure to supply any deficiency, or, as, owing to the substitution of motors for horses, it is becoming more and more difficult to procure and more expensive, we can substitute them in the right proportions for it.

THE WASTAGE OF NITRATE.

The most important of the three ingredients is the nitrate, because whereas the other two remain in the soil, it dissolves at once in water and quickly drains away into the lower strata beyond the reach of the roots. This can be illustrated in a simple way. If a plot containing plants of the same kind is divided into three parts, and one part is treated with phosphate, another with nitrate, and the third with potash, the plants on the nitrate-treated plot will almost certainly grow more rapidly than the others, thus showing that they needed nitrate more than either of the other two fertilisers.

THE BACTERIA IN THE SOIL.

It is true that Nature does something to make good the wastage of nitrate which is perpetually going on. The ground

is not, as might be supposed on the evidence of the eye, an inert mass. Its upper layers, those within about six feet of the surface, teem with living things, like a ripe cheese, and these living things, called bacteria, all so excessively small that they can be seen only under a powerful microscope, are incessantly engaged, so long as the conditions of temperature and moisture are favourable, in breaking up the organic matter in the soil—the manure, the decaying vegetation, and so forth —into simpler compounds, and converting it into plant-food. As we have already seen, there is plenty of air in the ground when in good condition, and not water-logged, and some of the bacteria take the nitrogen from it and "fix" it—that is, combine it with oxygen, and so make it into nitrate. If it were not for their activities millions of acres which now produce abundant growth would be sterile, while even the best cultivated land is enormously improved by their work. Still, it is not always sufficient. We are obliged to crop the ground so heavily and so continuously that the bacteria cannot keep pace with our requirements, and, if the yield is not to fall off, we must put in much of the nitrate which is taken out by the plants. It is essential, too, not to let the soil turn sour, for if it does, bacteria cannot live in it. The remedy is to apply lime, which neutralises the sourness or acidity.

CHAPTER IX.

STABLE MANURE AND ARTIFICIAL FERTILISERS.

THOUGH phosphate and potash do not drain away like nitrate, there must come a time when there is a shortage of them also, for they are gradually used up in the process of growth. That time must, of course, depend on the amount present in the ground when the trees are planted, and on the rate at which they grow. In clay there is usually a good deal of potash, but as it is difficult to tell, without chemical analysis, exactly what is in the soil and what is not, the common practice is to apply a complete plant-food containing all three ingredients. If the phosphate and the potash are in excess, they are not wasted, but remain available for future use.

WHEN TO APPLY STABLE MANURE.

Stable manure, as previously stated, is a complete plant-food; it contains all three ingredients, though not in the right proportions, for which reason it is improved by being supplemented by artificials. Before it can be used, however, it must be decomposed into simpler compounds, and these must be dissolved by the water in the ground, for the roots can absorb only such food as is in liquid form. Hence stable manure should be applied while the trees are at rest—that is, in autumn or winter. Some of it will then be ready for them when they start growth in spring, and as its decomposition is gradual, it will continue to supply them with food until it is exhausted —very often, if the dressing is heavy, for two seasons, if not for more.

THE COST OF STABLE MANURE.

In many market gardens, where the trees are in full bearing, the dressing is exceedingly heavy—often at the rate of fifty loads to the acre. The cost in the past has been about £10, but it will be more now, and, owing to the increasing price, is likely to be much more in the future. In order to ascertain whether it could not be reduced, a series of experiments have been carried out for several years, with the result that large crops were obtained by means of half the dressing, supplemented by artificials, and even of artificials alone. In both cases the expense was greatly lowered—in the former by about 30 per cent., and, in the latter, by about 60 per cent. Obviously, the fruit-grower, anxious to economise as much as possible, should turn his attention to artificial fertilisers.

ARTIFICIAL SOURCES OF NITRATE.

The chief artificial sources of nitrate are nitrate of soda and sulphate of ammonia. The latter contains a larger proportion of nitrogen than the former, and, if it can be bought at the same, or a less, price, it is the cheaper. It does not follow, however, that it should be preferred. Nitrate of soda abstracts moisture from the atmosphere, and consequently tends to make the soil moist. It is, therefore, generally better for light, dry land, and sulphate of ammonia for land inclined to be wet. The usual dressings are two hundredweight of the nitrate, and one hundredweight, or rather more, of the sulphate. As both are very soluble in water, they should be applied only when they can be used at once by the trees—in spring, or early summer—otherwise they will drain away and be wasted. In the case of plants capable of growing during mild weather in winter, it is different. It has been found that nitrate applied to wheat in November or December adds very considerably to the weight of the crop.

SOOT AS A FERTILISER.

Another source of nitrate is soot. Being quite insoluble in water, it cannot itself be a plant-food, but it is a carrier of plant-food. When coal or wood is burned, ammoniacal gases are driven off, and some of them—containing nitrogen—are absorbed in the pores of the soot. They are so powerful that if fresh soot is applied to growing plants, it will burn the foliage; it should first be exposed to the air for three or four days to allow some of the gases to escape. It may be used in orchards—in spring, or early summer—at the rate of about twenty bushels to the acre. It has a further value in reducing the number of injurious insects.

PHOSPHATIC MANURES.

The chief artificial sources of phosphate are basic slag and superphosphate of lime. As they dissolve slowly they should be applied in autumn or winter—basic slag at the rate of from six to eight hundredweight per acre, and the superphosphate at the rate of four or six hundredweight. The former should be bought as a very fine powder. If the particles are coarse, they will remain almost unaltered in the soil for many years, and will do very little good.

Bone-meal and guano are other phosphatic manures in common use.

SOURCES OF POTASH.

The chief sources of potash are kainit and sulphate of potash. As it remains in the ground, like phosphate, and does not drain away as nitrate does, it is usually applied at the same time as the former—kainit at the rate of four hundredweight per acre, and sulphate of potash at the rate of one hundredweight. As is indicated by the difference in the rates of application, the percentage of potash in the latter fertiliser is very much greater than in the former, and, therefore, the price is proportionately higher. As almost the whole of our

supplies have hitherto come from Germany, potash is now very expensive. Fortunately, there is a large amount in wood ashes, so all hedge chippings, prunings, and other garden refuse that will not readily decay should be carefully collected and burned, and the ashes distributed over the ground where potash is most wanted.

ARTIFICIALS THAT SHOULD NOT BE MIXED.

In connection with the use of artificial fertilisers, there is one point which should be mentioned. Certain of them should not be mixed with certain others. The combinations to be avoided are—basic slag and sulphate of ammonia, basic slag and superphosphate, superphosphate and nitrate of soda. It is not likely that basic slag would be mixed with sulphate of ammonia, because the former ought to be applied in autumn or winter, and the latter in spring or early summer; but if they are, they will react chemically on one another, with the result that the valuable nitrogen will escape into the air in the form of ammoniacal gas. If basic slag is mixed with superphosphate, the soluble phosphate in the latter is converted into an insoluble form, and is rendered useless as a plant-food. It is still worse to mix superphosphate and nitrate of soda, for the nitrogen not only escapes, but also does so as nitric-acid gas, which is deadly to animal and vegetable life.

LIME AS A FERTILISING AGENT.

Reference has been made to lime as a disintegrating agent for clay, and as a neutraliser of sour soil. Though not a fertiliser itself, it is a fertilising agent, for it hastens the decomposition of organic matter. It may, therefore, be used with advantage on clay or heavy loam occasionally—say, once in seven years—at the rate of fifty bushels to the acre. If it is used too often the land may be rendered sterile by being completely cleared of its organic matter or humus. Hence sandy soils are better without lime.

MANURING POINTS IN BRIEF.

The question of manuring may be summed up as follows:—

If the trees are making satisfactory growth they do not require more food than they can get in the ground. But when the growth begins to show signs of weakening they may be dressed in autumn or winter with not more than twenty-five loads of stable manure per acre, supplemented by four hundredweight of kainit (or one hundredweight of sulphate of potash) and six hundredweight of basic slag (or four hundredweight of superphosphate), followed in spring, after the fruit is set, by two hundredweight of nitrate of soda (or one hundredweight of sulphate of ammonia). When no stable manure is used, the quantities of the artificials may be doubled. If the land is heavy, and believed to contain enough organic food material, but not in a soluble form, and especially if it is inclined to be sour, a dressing of lime may be substituted for the others suggested.

A soluble fertiliser, preferably in liquid form, applied in early summer to trees bearing heavy crops, will assist them to swell their fruit and to make the necessary growth.

Nitrogenous manures, if not others, should be strewn on the surface, and not dug in—only hoed in lightly. As soon as they dissolve they begin to sink, and though the sinkage is, of course, very slow, they will eventually drain down into the lower strata, unless they are captured on the way. The higher they are placed in the ground at first, therefore, the longer the time the roots have to make use of them, and the less waste there is likely to be.

CHAPTER X.

INJURIOUS INSECTS.

THERE are, unfortunately, a large number of different kinds of insects which attack fruit trees. Some injure the foliage, others the buds, others the blossom, and others the branches or the roots, while several do not confine themselves to a single part. Unless prompt measures are taken against them, they may cause the loss of the crop and seriously damage, if not destroy, the trees.

DIFFERENT CLASSES OF INSECTS.

One of the most effective measures is spraying. For this purpose the insects under consideration may be divided into two classes—those which eat the tissues, and those which merely suck the sap. Among the former are caterpillars of various species, and among the latter aphides and mussel scale. As all insects breathe through pores in their bodies, they must die if the pores are blocked up by soapy or oily liquids. This method is the one generally employed against the sap-suckers. It is, however, useless against hairy caterpillars, which form the greater part of the tissue-feeding class, for the hairs prevent the liquid from reaching their skins. To kill them we must poison their food. But when every care is taken, some of the insects are almost sure to escape, and when they hibernate or lay their eggs on the trees, they should be destroyed in winter. This should be done by means of a burning liquid, applied after the leaves fall and before they begin to grow again.

INSECTICIDES.

Very many insecticides to serve these three purposes have been put on the market, and most are good in their different ways. But the fruit-grower who wishes to work in the most economical manner will make his own, and the following four are all that he will require.

FOR SAP-SUCKING INSECTS.

1. **Soap Wash.**—Dissolve half a pound of soft soap in two gallons of water. Spray when the insects first appear, and, if necessary, at intervals afterwards. For aphides, the quantity of water may be doubled.

2. **Paraffin Emulsion.**—More powerful than No. 1. Dissolve half a pound of soft soap in one gallon of hot water, and churn in two gallons of paraffin. Keep in corked bottles. Use with ten times its bulk of water.

FOR TISSUE-FEEDING INSECTS.

3. **Paris-Green Wash.**—Dissolve ten ounces of Paris green in twelve gallons of water. Spray the foliage thoroughly when caterpillars attack it, but, as **the liquid is poisonous,** not within five or six weeks of the time of gathering the fruit. It should be kept stirred while it is being used, for, if too strong, it will injure the leaves.

FOR HIBERNATING INSECTS AND THEIR EGGS.

4. **Woburn Wash.**—Dissolve separately in water one pound of commercial caustic soda and one pound of crude potash. Mix the two, stir in three-quarters of a pound of soft soap, and add more water to make ten gallons altogether. Use in winter to destroy moss, lichens, and any hibernating insects or their eggs. As it is caustic, it should be kept away from the person and the clothes. Gloves should be worn while spraying.

THE IDENTIFICATION OF INSECTS.

To assist in the identification of the different insects, they are arranged according to the part of the tree which they generally attack. There are others, but those given are the most likely to be troublesome. In the case of moths, it is not the perfect insect (the moth) that does the damage, but the larva (the caterpillar or maggot). The kind of tree on which each pest is commonly found is stated.

INSECTS THAT SUCK THE SAP.

Aphides, or Plant Lice.—Apple, Plum and Cherry. Mostly

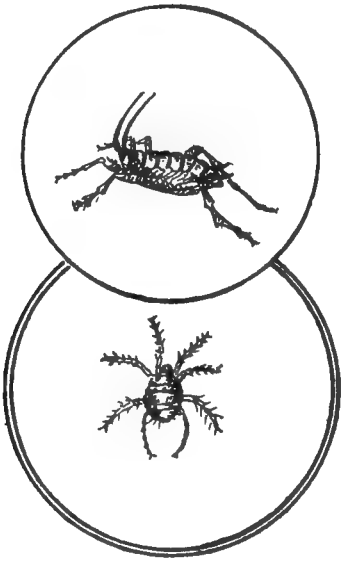

Fig. 18.—Aphis (above), and Red Spider (below), both highly magnified.

wingless, green, or nearly black, they collect on the lower side of the leaves, cause them to curl and lose their colour, secrete a sticky fluid, which eventually turns black, migrate

to other plants in summer, and return in September. Spray with soap wash or paraffin emulsion. See also Woolly Aphis.

Mussel Scale.—Apple, Pear, and Plum. Small mussel-like brown or grey insects, they attach themselves firmly to branches and fruit, as well as to foliage, the eggs remaining under the scaly coverings when the females die. Paraffin emulsion in June; Woburn wash in winter.

Pear-Leaf Blister Mite.—Pear. Invisible to the naked eye; they cause numbers of small, green, red or brown blisters on the leaves. Paraffin emulsion at the end of May. Also, take off and burn all blistered leaves.

Red Spider.—Apple, Pear, Plum, and Peach. Minute brownish insects, chiefly on the lower side of the leaves, where they lay their eggs in grey webs; they feed on the leaves from spring to autumn, and turn them a mottled, sickly colour. Paraffin emulsion, with the addition of liver of sulphur at the rate of a quarter of an ounce to the gallon. It does not destroy the eggs, and as they hatch in batches, it should be applied every day until the foliage is clean.

INSECT THAT EATS HOLES IN THE LEAVES.

Plum Weevil.—Plum. Small, black, reddish-legged beetles; they damage the buds, and often the bark, as well as the foliage, in spring and summer, and spend the winter in the ground. Hoe frequently to expose them to birds and in autumn apply a dressing of soot and lime round the trees.

INSECT THAT EATS THE UPPER SURFACE OF THE LEAVES.

Pear and Cherry Sawfly.—Apple, Pear, Plum, and Cherry. Small, black fly, which appears about the end of May. The slimy, dark-green or black larvæ are called slug-worms. From June to October they feed on the upper surface of the leaves, the lower surface remaining as a white skin. Spray with Paris green.

INSECTS THAT EAT THE ENTIRE LEAVES.

Insects that eat the entire leaves may be divided into three classes—caterpillars that live in great numbers under

Fig. 18.—Slugworms, the larvæ of the Pear and Cherry Sawfly.

webs, caterpillars in small groups that spin the leaves together, and caterpillars without webs.

MANY CATERPILLARS LIVING UNDER WEBS.

Brown-Tail Moth.—Apple, Pear, Plum. The moth (white wings and brown tail) appears in August, and lays its eggs under a web in the trees, generally at a fork. The caterpillars (black, with brown hairs, and red and white lines) begin to feed soon, hibernate under the webs, and disperse over the trees in the following summer. Destroy the nests in winter, and, when the caterpillars are on the move, spray with Paris green.

Lackey Moth.—Apple, Plum. The moth (ochreous and brown) lays its eggs about August in hard fossil-like bands round the twigs. The caterpillars (hairy and black, afterwards striped with orange and blue) emerge in April, and spin a web around some leaves, on which they feed, afterwards going

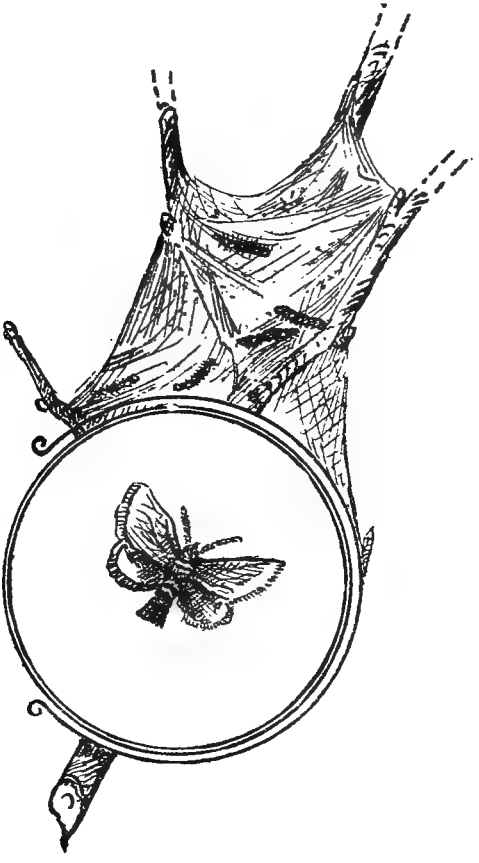

Fig. 20.—Brown-tail Moth and Nest of Caterpillars.

further afield. Destroy the egg-bands in winter, and the webs in spring. Spray the caterpillars with Paris green.

Small Ermine Moths (Several species).—Apple, Plum. The moths (white or grey, with dark spots) lay their eggs in July and August on the branches, and the tiny caterpillars (yellow or grey, with black heads) begin to feed in the following spring on the blossoms as well as on the leaves, which they spin together. Destroy the webs, and spray well with paraffin emulsion or Paris green.

Winter Moths.—Apple, Plum, Filbert, and other trees. In October the brownish moths emerge from the chrysalids in the ground, and the wingless females crawl up the trees to lay their eggs in clusters, which hatch in March, the tiny, striped, or yellow, black-headed caterpillars spinning together some leaves, and sallying forth to eat foliage and blossom. Spray the caterpillars with Paris green; tie bands of grease-proof paper, smeared with grease, tightly round the trunks early in October, about four feet from the ground, and leave them on until April or May, renewing the grease when necessary; also hoe the soil round the trees towards the end of summer to expose the chrysalids to birds.

FEW CATERPILLARS THAT SPIN THE LEAVES TOGETHER.

Magpie Moth.—Plum, but more often Currant and Gooseberry. The moth (cream, with black spots and yellow bands) appears in July and August; the caterpillars, similarly coloured, begin to feed in autumn, hibernate on the trees or in the ground, and resume their destructive work in spring. Spray with Paris green, and in autumn strew quicklime on the ground.

CATERPILLARS WITHOUT WEBS.

Vapourer Moth.—Apple, Pear, Plum. Moths (brown, the females wingless) appear in August and September, and generally lay their eggs (two or three hundred) on the cocoons

attached to the trees. The caterpillars are large and handsome, grey, with orange and white lines, hairy and tufted, and have eight pairs of feet. As the eggs hatch at different times

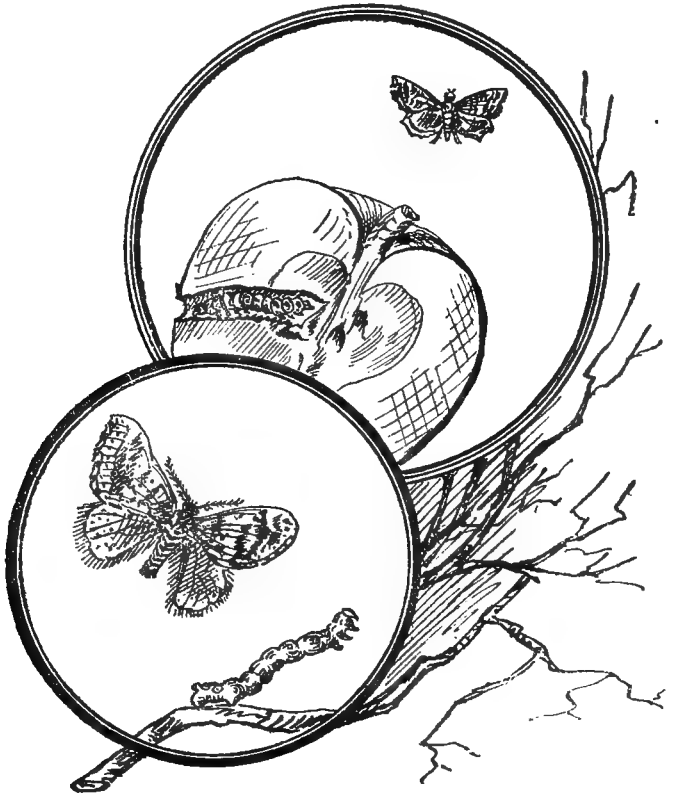

Fig. 21.—Codling Moth (above), and Winter Moth (below).

their season is a long one—from May to September—and they are capable of doing much damage. Destroy the cocoons and eggs in autumn and winter, and spray the caterpillars with Paris green.

There are at least ten or twelve kinds of insects which are liable to cause serious damage to the fruits of such trees as Apples, Pears, and Plums. Most of them attack either the blossoms or the immature fruit soon after the blossoms have fallen. But, as they differ widely in their habits, it is necessary to fight them in different ways. They are arranged in alphabetical order.

INSECTS THAT INJURE BUDS, FLOWERS, OR FRUIT.

Apple-Blossom Weevil.—Apple, Pear. The weevils (small, downy, greyish-black beetles) hibernate in cracks in the bark, and early in spring bore into the flower-buds, and lay their eggs singly in them. The larvæ (tiny cream-coloured maggots) eat the stamens and pistil, and the buds wither without opening. Spray with Woburn wash in winter.

Apple Sawfly.—Apple. The sawflies (reddish-yellow and black, with translucent wings) lay their eggs in the calyx of the immature fruit. The small caterpillars (white, with black or brown heads, and ten pairs of legs—two pairs more than those of the Codling moth caterpillar) bore into the centre of the young fruit, and, just before it falls, in June or July, eat their way out at the side, entering the ground to spin yellow cocoons, in which the winter stage is passed. Spray wih paraffin emulsion when the blossom is opening. Destroy all fallen fruit, and in winter hoe the ground, and, if possible, turn in poultry.

Apple-Sucker.—Apple; another species on the Pear. Reddish-green insects, having some resemblance to aphides. Like them, they secrete a sticky fluid, and, like frog-hoppers, they spring from leaf to leaf. They lay their eggs on the twigs in autumn, and the tiny larvæ crawl in spring into the flower buds, and also into the wood buds, and so destroy them.

Spray with paraffin emulsion as soon as the fruit is gathered, and in winter with Woburn wash.

Codling Moth.—Apple, Pear. The moths (small, grey and yellow, with brown markings) lay their eggs singly on the young fruits in May and June, and the tiny caterpillars bore into the fruits and bring them down prematurely, in the same way as the larvæ of the Apple sawfly. They hibernate on the trees and under dead leaves, rubbish, and so forth. Destroy fallen fruit, spray with Paris green within ten days of the time the blossom falls (so that some of it gets into the still open eye, at which the caterpillars enter), and in winter spray with Woburn wash. As the caterpillars crawl up and down the trees, many of them can be trapped in bands of sacking tied round the stems early in summer ,and frequently examined.

Mussel Scale.—This insect is found on the fruit, as well as on the leaves and shoots. See p. 57.

Pear Midge.—Pear. The midges (small, grey, with long antennæ and legs) appear in April and May, and lay their eggs in the buds or blossoms. The larvæ bore into the fruit, leaving just before, or just after, it falls to the ground in June. They spend the winter in cocoons, about two inches below the surface. Spray with paraffin emulsion when the blossoms first show colour; destroy fallen fruit; dress the ground with half a ton of kainit to the acre at the beginning of June; skim off in winter the top two inches of soil, and burn or bury it deeply.

Winter Moths.—The caterpillars eat the blossoms, as well as the leaves. See p. 60.

Wasps and Ants are generally included in this class. The latter are supposed to make holes in the fruit, but it is more likely that the holes, in which they are sometimes found, are

made by wasps and birds. Another serious charge has been brought against them—that they tend aphides during the winter, and carry them from place to place. As they are very fond of the sticky fluid secreted by the aphides, it is possible. Certainly, they usually abound where the latter are numerous, and they are not likely to cause trouble if the aphides are cleared away. Syrup, containing arsenic, is sometimes recommended for poisoning them, but anything of this sort is very dangerous in a garden. The only really effective way of getting rid of wasps is to search for and destroy the nests.

INSECTS THAT INJURE THE SHOOTS.

The chief insects which damage the wood of fruit trees are the mussel scale (previously dealt with in connection with

Fig. 22.—Woolly Aphis or American Blight, highly magnified.

foliage), the oyster-bark scale, and the woolly aphis. There are several others which bore into the wood, but they are not very common, except, perhaps, in old and neglected orchards.

Oyster-Bark Scale. — Apple, Pear, Plum, Cherry. Rounder in shape than the usual mussel scale, but very similar in its habits. Paraffin emulsion while the trees are in leaf; in winter, Woburn wash.

Woolly Aphis.—Apple, sometimes Pear. These insects

can easily be identified by the white, woolly patches with which they cover themselves. They pierce the bark, suck the sap, and in time cause serious wounds, surrounded by rugged bark, and generally infected with canker. (See pages 71 and 72.) The aphides do not always remain on the branches, but migrate to the roots. Eggs are laid on the trees in autumn, and many females hibernate in crevices in the bark. Apply paraffin emulsion or spirits of wine with a hard brush to the white patches, and throw soot and lime thickly on the ground close to the trunks, to prevent the insects on the roots from ascending; in winter spray with Woburn wash.

CHAPTER XI.

FUNGOID DISEASES OF FRUIT TREES.

IF the common fungoid diseases of fruit trees are not as numerous as the injurious insects, they are often more persistent, and may be even more serious in their effects. Like the insects, they attack different parts of the tree—the foliage, the branches, or the fruit; sometimes more parts than one. As a rule, they may be regarded as a sign of something wrong with the cultural methods, for the first trees to suffer are those that have been weakened by want of food, defective drainage, scarcity of fresh air, or some similar cause. It is essential, therefore, to ascertain what is wrong, and to endeavour to remedy it. Unless that is done, no kind of special treatment is likely to be permanently successful.

HOW INFECTION TAKES PLACE.

Fungoid disease is introduced into a healthy orchard by means of spores. They may be brought from an infected area by the wind, by birds, or flying insects; even by dirty tools, or on the boots. When the conditions of temperature and moisture are favourable, the spores germinate, and if the environment is suitable for their development—if, for instance, those that attack the leaves of a particular species are on such leaves—they penetrate the tissues, and the fine thread-like mycelium grows rapidly inside them.

LIMITATIONS TO INFECTION.

Fortunately, each species of parasitic fungus has its own particular host-plant, on which its life is spent. It may some-

times have more than one, but if so, they are, as a rule, closely related. It cannot live on any others. To this extent its opportunities for harm are limited. There is no need to fear that, if Apples are growing near mildewed Roses, the disease will spread to them, for the species of mildew which attacks the Apple is different from that on the Rose. There are other limitations to the spread of disease. The fungi which attack the shoots cannot penetrate sound and healthy bark. They can enter only at a wound. Hence, when a branch is cut off in pruning, the wounded surface should be coated with tar. Even the hardness, or softness, of the foliage may make a considerable difference in the power to resist disease. When plants are grown in a close atmosphere under glass, their foliage is so softened that they are much more liable to be attacked than others in the open air. Between those in a warm, moist valley, and those on a bleak hillside, there is a similar difference, though, of course, it is not so pronounced.

THE SPORES OF PARASITIC FUNGI.

The fact that these minute fungi develop inside the tissues makes it very difficult to get rid of them without injuring the plants. But, like Mushrooms, which develop under ground, their mycelium spreading in all directions, and rise into the air to ripen their fruit, these fungi must also come to the surface to ripen their spores, and, if the spores are destroyed before they scatter, the infection of other trees, and of other parts of the same tree, is prevented. Spores may be produced in summer, and again in autumn. The latter are called resting spores, because they remain dormant during the winter, starting to grow when the temperature rises in spring. It is by their means that infection is carried on from year to year. If they are destroyed, the disease is stamped out, unless, as is the case with some parasitic fungi, the mycelium is perennial—that is, keeps on spreading among the tissues for many years.

USEFUL FUNGICIDES.

The most useful liquids for spraying trees which are infected, or threatened with infection, by fungoid diseases, are:—

Bordeaux Mixture.—Dissolve, separately, in wooden tubs, two pounds of copper sulphate in five gallons of water and five pounds of fresh lime, previously slaked, in the same amount of. water. Mix the two, and keep stirred while spraying.

Lime-Sulphur Wash.—Quicklime, four pounds; flowers of sulphur, four pounds; water, twenty-five gallons. Slake the lime in a barrel by pouring on it one gallon of water, stir in the sulphur, adding enough water to make a paste; when the boiling ceases, pour in the rest of the water, and strain through a fine sieve before using. Excellent for plants whose foliage is likely to be damaged by Bordeaux mixture.

Liver of Sulphur.—Dissolve half an ounce in one gallon of water. The addition of a little soft soap will make it more adhesive. It blackens paint. Like the next, a simple, cheap, and easily-made fungicide, excellent for mild forms of disease.

Potash Permanganate.—Dissolve just sufficient to make the water a pale rose colour.

Wisley Lacto-Burgundy Mixture.—The ingredients are:—Copper sulphate, nine and three-quarter ounces; sodium carbonate, eleven ounces; milk, three-quarters of a pint; and water, three gallons. Dissolve the copper sulphate in half the water in a wooden tub; treat the sodium carbonate in the same way; mix the two and add the milk.

FUNGOID DISEASES ARRANGED UNDER SYMPTOMS.

It is impossible to arrange fungoid diseases in the same way as injurious insects, because the parts which show the effects may not be those which are attacked. For instance,

if the leaves droop, or wither, the cause may not be in them, but in the stem or the roots. For the purpose of identification, therefore, it will be best to give a list of the principal diseases under the symptoms most likely to attract attention, and then, for easy reference, to take them in alphabetical order.

FUNGOID DISEASES OF FRUIT TREES ARRANGED ACCORDING TO SYMPTOMS.

Foliage Affected:—

Blotched (dark) under the skin, which afterwards breaks (Apple and Pear scab—see Fruit).

Blotched (olive-green) on the surface (Brown rot—see Fruit).

Blotched (red) and blistered (Peach Leaf-curl).

Spotted (reddish), afterwards holes, leaves falling early (Plum-Leaf blight).

Spotted (reddish) on lower surface, no holes, falling early (Plum-Leaf rust).

Spotted (brown, small, numerous) on both surfaces, then holes (Shothole fungus).

Whitened (very pale, yellow or white). (Chlorosis).

Whitened (only upper surface) (Silver leaf).

Whitened by powder (Mildew).

Withers and hangs (Cherry-Leaf scorch).

Withers and falls, young trees (Stem Disease—see Stem).

Withers and falls, older trees, red globules on bark (Coral-spot disease).

Droops and turns yellow (Tree-root rot—see Stem).

Fruit Affected:—

Blotched and cracked (Apple and Pear scab).

Blotched brown; then grey tufts; fruit mummified (Brown rot).

Malformed and wrinkled (Plum-pockets).

Branches or Stem Affected:—

Wounds, ridged round by rough bark (Canker).
Exudation of gum (Gummosis).
Small cracks in bark of young trees (Stem disease).
Clusters of brownish toadstools near the ground (Tree-root rot).
Red globules on bark (Coral-spot disease).

FUNGOID DISEASES IN ALPHABETICAL ORDER.

The fungoid diseases which follow are only a few of those that attack fruit trees, but they are the commonest, and the most troublesome. The popular names are used because they

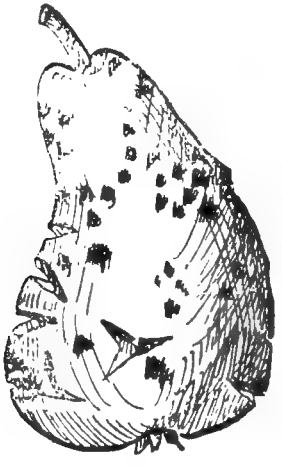

Fig. 23.—Pear Scab.

are more easily remembered than the botanical names of the fungi.

Apple and Pear Scab.—Apple and Pear; different species of fungi, but very much alike. Black blotches (green, when the spores ripen) appear on the leaves, then on the shoots,

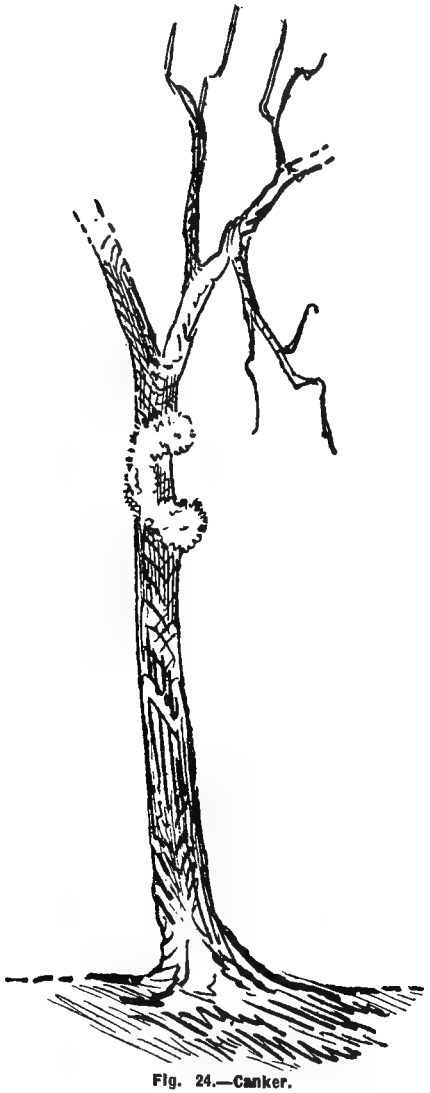

Fig. 24.—Canker.

and, finally, on the fruits, which remain small and crack badly. Spray, as soon as the attack is noticed, with Bordeaux mixture, at no more than half its usual strength; if it is stronger, the leaves will be injured. Burn all diseased fruit. In winter spray with a solution of sulphate of copper (one pound in twenty-five gallons of water).

Brown Rot.—Apple, Pear, Plum, Cherry. The fungus first attacks the leaves, causing superficial olive-green patches, which often escape notice. It spreads to the young shoots, or twigs, which may be killed, and to the fruit in the form of patches of grey tufts, usually in concentric rings, the fruit drying up and not falling. When the leaves are small, spray with Bordeaux mixture at half-strength; in winter remove and burn all dead wood and dried fruit, and spray heavily with copper-sulphate solution.

Canker.—Apple; less often Pear and Plum. Wounds, surrounded by ridges of rough bark, appear on the branches, and in time extend all round them. Towards the end of summer white specks of the fungus may be noticed in the ridges, and in spring tiny, red globules. Cut off and burn all badly-affected branches, and when the white specks show paint the diseased parts with a solution of iron sulphate, one pound to the gallon of water. As the disease is always associated with woolly aphis, it is probable that this insect causes the injuries which admit the infecting spores.

Cherry-Leaf Scorch.—Cherry. The leaves wither on the affected branches, and hang on them all winter. They carry infection into the next year. If they are all gathered and burned, the disease is stamped out, unless there is an infected area near from which fresh spores can come.

Chlorosis.—Plum, and many other kinds of trees. Though this disease is not known to be due to a fungus, it may be mentioned here. The leaves lose their green colour owing to the disappearance of the chlorophyll, and become

yellow, white, or variegated, sometimes on a single branch, and sometimes on the whole tree. The new wood is weak, the foliage small, and the fruit worthless. As lime seems to favour the disease, it should not be applied to an infected area. In spring, water the ground thoroughly with a solution of iron sulphate, one ounce to the gallon of water.

Coral-Spot Disease.—Apple, Pear, Currant. The leaves wither and fall, the bark shrivels, and in a few weeks coral-

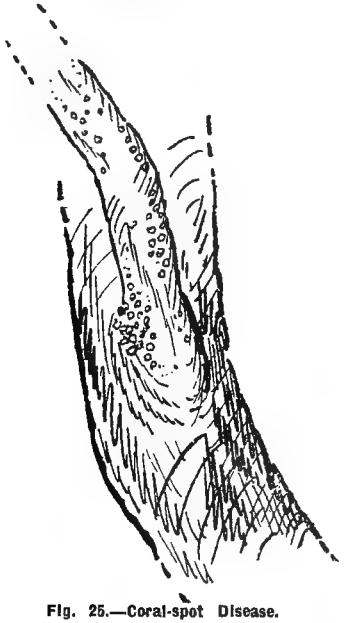

Fig. 25.—Coral-spot Disease.

red globules appear on it. Spraying seems to be useless. Cut off all diseased branches—if possible, well into healthy wood—and burn them. Coat all wounded surfaces with tar.

Gummosis.—Plum, Cherry, and other stone-fruits. The spores of this fungus are produced early in spring in small

red patches, on the lower surface of the foliage. They drop out in June, leaving circular holes, and infect and kill the shoots, causing an exudation of gum. Burn diseased shoots and spray in spring with lime-sulphur wash.

Fig. 26.—Peach-leaf Curl.

Peach-Leaf Curl.—Peach. Red blisters on the foliage, and brown patches on the young growth, which dies back. The mycelium is supposed to persist in the young shoots, and

the usual practice has been to cut them off. But a complete cure has been effected at the Royal Horticultural Society's Gardens, at Wisley, by pruning carefully before the buds burst—in January, or early in February—and spraying thoroughly with Wisley lacto-Burgundy mixture.

Mildew.—Apple, Plum, Cherry. The disease shows as a dense, white powder on the foliage in summer, and arrests the growth of the shoots, the leaves being consequently crowded together in rosettes at the top. The mycelium apparenly persists in such young growth as is made. When the disease is mild, spray as soon as it is noticed with Bordeaux mixture at half-strength; when severe, cut off and burn the infected rosettes of leaves. Aphides are generally associated with mildew, and should be destroyed.

Plum-Leaf Blight.—Plum, Cherry. About May reddish spots appear on the leaves, afterwards causing holes, the trees being often defoliated early in the season. Spray with Bordeaux mixture at half-strength.

Plum-Leaf Rust.—Plum, Cherry. Very similar to the last disease, except that it does not cause holes. Same treatment.

Plum Pockets.—Plum. The fruit is malformed, wrinkled and discoloured. As the mycelium persists in the young shoots, spraying has hitherto been only temporary in its effects. Infected shoots should be cut off and burned. The fungus is closely related to the one which causes Peach-leaf curl, so the same spray might be tried for it.

Shot-Hole Fungus.—Peach, Cherry, and other stone-fruits. Numerous small, circular spots on the foliage, brown on both sides, eventually dropping out. The leaves fall early, and, in consequence, the next crop is a failure. A difficult disease to cure. When the leaves begin to expand, and at intervals afterwards, spray well with lime-sulphur wash.

Silver Leaf.—Plum, Peach, and other stone-fruits. The leaves lose their green colour, and have a silvery appearance. The death of the affected part, sometimes a single branch, and sometimes the whole tree, follows. The disease can easily be distinguished from chlorosis, as only the upper surface is affected. It is due, not to the loss of chlorophyll, but to the pressure of air under the skin. The cause is doubtful, and no cure is known. A parasitic fungus, which stains the wood red, and produces purplish or brown incrustations on the bark, is frequently associated with the disease, but the association is not invariable. As some authorities connect silver leaf with excessive quantities of nitrogenous manure, this condition should be avoided.

Stem Disease.—Apple, Pear, Plum; sometimes other stone-fruits. Attacks are confined to young trees, mainly in clay soil, and especially when planted too deeply. The leaves wither and fall early, and the bark shrivels, the small, narrow cracks which appear in it containing the spores of the fungus and spreading infection. In the following year there are larger cracks, and the trees are soon killed. To prevent the spores from germinating in the cracks, paint the stem with soft soap, reduced to the consistency of thick paint by means of a strong solution of washing soda, with the addition of one pound of powdered quicklime to every five gallons. Badly-diseased trees should be grubbed up and burned.

Tree-Root Rot.—Nearly all orchard trees. The leaves droop and turn yellow, and if some bark is removed near the base of the tree a white felt of mycelium will probably be seen underneath. At this stage the case is hopeless. The fungus is rather a large toadstool, brownish-yellow, with small, dark scales, the stem similarly coloured with a frill near the top. It grows in clusters round the roots. As the disease does not show itself until it is practically incurable,

little can be done except to prevent infection of healthy trees. Black cords of mycelium travel in the ground for great distances in all directions, penetrating the bark of any tree they reach. To stop them, a trench, eight inches deep, should be

Fig. 27.—The Toadstools which Cause Tree-root Rot.

dug round any infected tree, well beyond the spread of the branches. All the toadstools should be collected and burned, and as spores are another source of infection, any wounds should be dressed with tar.

CHAPTER XII.

FRUIT TREES ON WALLS.

THE fruit trees generally grown against walls are Apricots, Peaches, Nectarines, and Figs (on a south or south-west aspect), Morello Cherries (on a north aspect), and some of the choicer varieties of Apples, Pears, and Plums. The Fan-shaped form, the branches radiating from the stem,

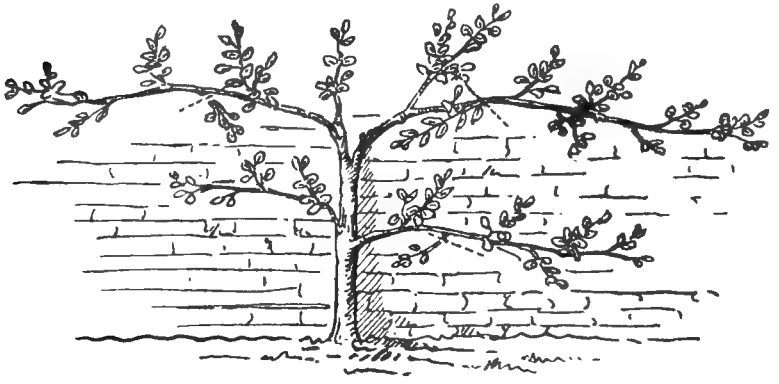

Fig. 28.—"Foreright"—shoots which grow right away from the wall, and as they cannot be trained in, must be cut off.

is generally preferred, but those that fruit on spurs are often trained as espaliers, tier upon tier of branches, until the whole space is covered.

There is one obvious difference in the manner of growth between trees in the open and those against a wall. While the former can, and should extend in every direction, the latter are, or should be, confined to a single plane, parallel

to the wall. Branches which grow outwards are called "fore-rights." As they cannot be trained in, they should be cut away completely, unless it is possible to convert them into spurs (see page 38). With this exception, the treatment of Apples, Pears, and Plums against walls, is very much the same as for bushes.

NAILING UP FRUIT TREES.

Strips of cloth, held by cast-iron nails, are generally employed for attaching the branches to the wall. Lead is sometimes used instead of them, but is more liable to chafe the bark. As the nails have large, square heads, they do not easily tear through the cloth. They should be driven in above, and not below, the branches, so that the latter may be slung from them, and not pressed by their weight against them. It is important to avoid fraying, not only of one branch against another, but also of a branch against a nail or the wall itself. For this reason a rough wall is unsuitable for fruit trees. Exposed, as the cloth strips must be, to all weathers, they should not be left too long, otherwise they may give way suddenly under the weight of a heavy crop, and a branch may break, spoiling the tree. A year is quite long enough to allow them to remain. They should then be replaced by new ones. If this is done in winter, the best time, they should be burned, for they will probably contain hybernating insects or their eggs.

TENDER STONE-FRUITS AND FROST.

Apricots, Peaches, and Nectarines are grown against south walls, not only because they are protected from cold winds, but also because the bricks, of which most walls are built, absorb some of the sun's heat during the day, and consequently keep the trees warmer at night. In spite of this fact, they are not infrequently damaged by frost, the flowers open so early in the year. It may seem strange that they

should persistently do so when it is injurious to them; the explanation is that they are not natives of this country, and that the habit contracted in the warmer climate from which they came has not been altered by centuries of cultivation here. It is, therefore, advisable to protect the flowers in some way. This is most easily and most economically done by hanging in front of them some Strawberry netting, folded once or twice. It will not prevent sunshine and air from reaching the plants, while, by checking radiation from the wall, it will keep the temperature several degrees higher than that of the air outside. The netting should be left in position until about the end of May

THE MANAGEMENT OF APRICOTS.

Apricots fruit principally on spurs. The main branches should, therefore, be allowed to extend as far as possible, and strong side-shoots should be trained in to fill up any space between them. The other side-shoots should be shortened in summer, and cut back in autumn to two or three buds to form spurs. The fruits are often much too crowded; they should be thinned, while small, to a distance of three inches or more. A dressing of manure will increase their size, and also keep the trees healthy. Apricots, like all other stone-fruits, need lime, and if there is not sufficient in the soil, it should be added. With this object, old mortar or chalk is often dug in before planting, but applications of basic slag or superphosphate will serve the same purpose, and supply phosphate as well.

PEACHES AND NECTARINES.

As Peaches and Nectarines fruit chiefly on the young wood of the previous year, they may be classed together. They are mostly trained fan-shaped. In order to provide the necessary new wood, a bud should be left at the base of each bearing-shoot, all others on it being removed in spring, with

the exception of the one at the tip, which should be allowed to remain in order to assist in keeping the sap flowing throughout the whole length of the shoot. In autumn, after

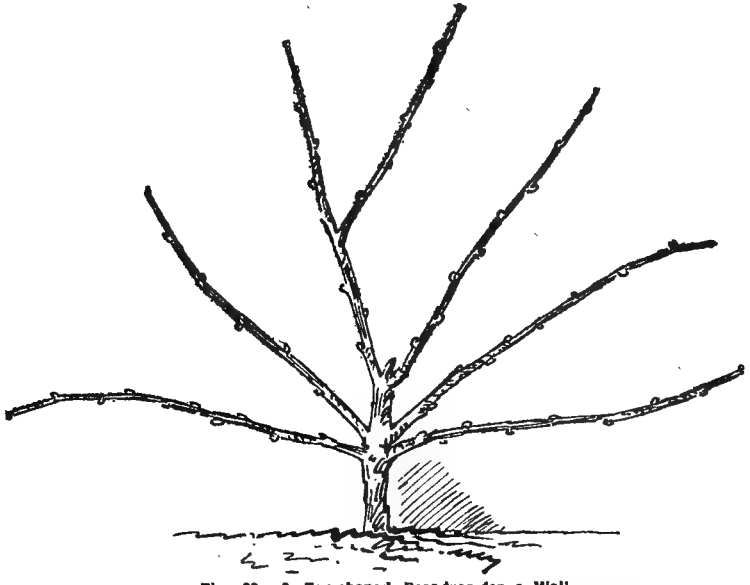

Fig. 29.—A Fan-shaped Pear-tree for a Wall.

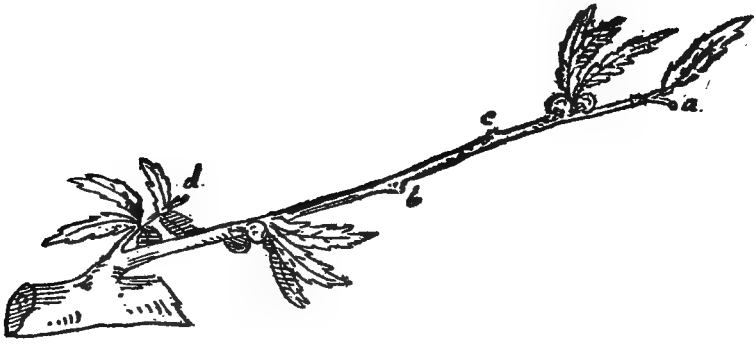

Fig. 30.—A Peach shoot stopped at a, and with the side-shoots removed at b and c, to be cut away after the fruit is gathered, when the young shoot at d will take its place.

the crop is gathered, the old bearing-wood should be cut away, and the shoots which have grown from the base buds should be nailed to the wall in their stead. This is the method which should be adopted in the case of trees strong enough to cover all the wall-space that can be allotted to them. Of course, when they are younger and smaller they must be permitted to build up the necessary framework before they are pruned so much.

The insects and fungoid diseases which attack the Peach, the Apricots, and the Nectarine, have been described in the chapter dealing with the subject.

CHERRIES AND PLUMS.

It has previously been stated that the less Cherries and Plums are cut the better, because it renders them more susceptible to various diseases, and this applies not only to those in the open, but also to those against walls. In the latter case, however, if they were allowed to grow without restraint, it would be impossible to train them, so some pruning is necessary, especially at first. It is best confined to removing "fore-rights," stopping side-shoots which are to be shortened still more in autumn, and thinning any that are too crowded. When this is done carefully, there is rarely anything further to be done in winter. But if any branches have to be cut away, the wounded surfaces should be coated with tar.

FIGS IN THE OPEN AIR.

As the Fig is not hardy, it requires a warm situation, such as a corner, with walls on the north and east sides. In its native habitat—the Mediterranean region and Southern Asia—it produces and matures three crops in the year; here it produces two, but in the open air succeeds in maturing only one. If a tree is examined in August or September, it will be found to carry a number of round fruits about the

size of a pea, and also others fig-shaped and very much larger. The latter form the crop that will not mature. As they would fall off in winter or early spring, they should

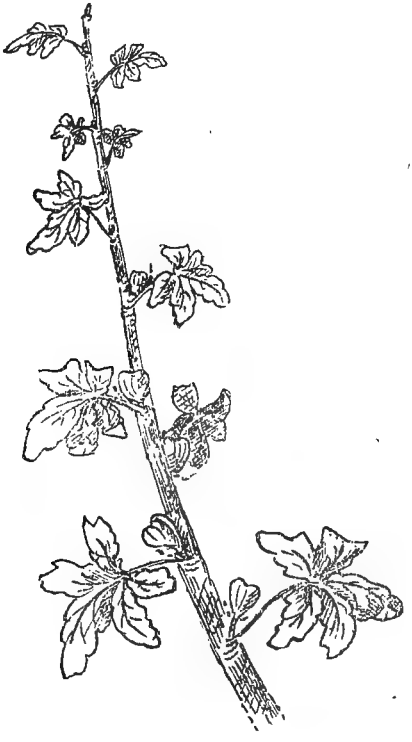

Fig. 31.—Fig shoot, the larger fruits to be removed in autumn, and the smaller left.

be removed now, in order that as little material as possible should be wasted in them. The others will begin to swell in May and ripen in summer.

As the Fig is a rampant grower, it should be kept in rather poor soil, and even then it may produce so many shoots that some of them must be thinned out. If the roots are in a confined space, such as a small bed enclosed by brick walls and hard paths, it will grow less luxuriantly and bear larger crops. Where these conditions are absent, it should be root-pruned every few years.

Propagation can be easily effected by means of layers or suckers; or of cuttings of the previous year's shoots, inserted in pots of sandy soil in spring, and placed in the greenhouse.

The Fig is sometimes attacked by scale, and sometimes by canker. They should be treated as advised in the chapters on injurious insects and fungoid diseases.

CHAPTER XIII.

GRAFTING, AND THE RENOVATION OF OLD TREES.

FROM the utilitarian standpoint, there can be no doubt that the best way to treat worn-out old trees is to grub them up. Besides being unprofitable, they harbour injurious insects and parasitic fungi, and are thus centres of infection, and they can be so cheaply replaced by young trees of the finest kinds. In some gardens, however, they are picturesque objects, and for that reason, or because of their associations, there often is a reluctance to get rid of them. In such cases they can generally be made more ornamental by using them as supports for climbers. Some of the Rambler or Wichuraiana Roses will send up shoots twenty feet or more in length in the course of a year or two, and when these shoots reach the top of an old Apple or Pear, and then hang down in long sprays of beautiful flowers, they are exceedingly effective.

THE MANAGEMENT OF OLD TREES.

Some old trees need only proper management to make them profitable. They may have been spoiled by neglect, or they may be worthless varieties, but if they are in a healthy condition, it would be a pity to destroy them, for their renovation should not be difficult. If they are growing too vigorously to flower, they should be root-pruned; if, after flowering, they do not fruit, other varieties should be associated with them. Both these matters were dealt with in the opening chapters. Loss of vigour may be due to suckers, want of manure, disease, or various other causes. Some pruning is

sure to be necessary. But it would never do to prune an old and neglected tree in the same way as a young one, for an immense amount of wood would have to be removed, and the result would be far from satisfactory. All that can be done is to cut away dead and dying branches, and to thin where necessary. The wounds should be dressed with tar.

PREPARATION FOR GRAFTING.

Trees of poor varieties require different treatment. As no method of pruning or manuring would effect any real improvement, they should be used as stocks for grafting on scions of good varieties. The best time for the operation is the beginning of April, when the sap is in motion. But the shoots from which the scions are to be cut should be taken off a month or two earlier, and laid, with their cut ends in soil under a north wall. Unless this is done they will probably be in a more forward condition of growth than the older wood of the stock, with the result that a swelling will presently appear just above the graft. When the stock is more forward than the scion, the swelling is below the graft. When both are, as they should be, in the same condition, there is little or no swelling.

"HEADING BACK."

The tree may be "headed back," either in winter or just before the operation in spring. If it has a number of strong, healthy branches, each may be sawn off about six or eight inches from the stem. If it is desired to graft on the stem itself, it should be cut down to the required height.

THE PRINCIPLES OF GRAFTING.

There are many different methods of grafting, but it is not necessary to describe more than two or three. The general principle is the same in all. The inner wood, it must be remembered, has finished its growth. It is quite inert, and

nothing that can be done will restore its active functions and make it unite with anything else. If a union is to be effected between a scion and a stock, it can only be at the outer layer of each, the cambium layer, where growth is still in progress. Whatever method of grafting is adopted, perfect contact between these two layers is essential.

WHIP-GRAFTING.

In whip-grafting, a slice is cut off the lower part of the scion, a shoot with three or four buds, and the stock is simi-

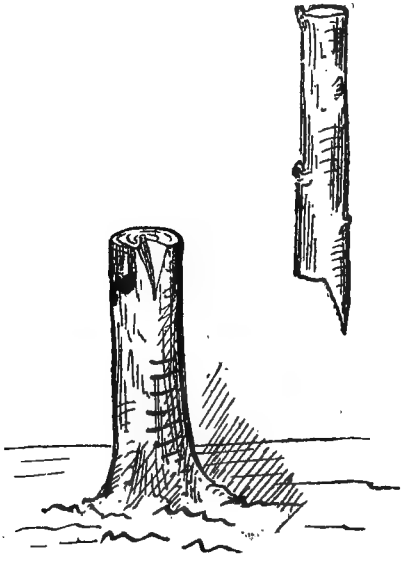

Fig. 32.—Whip Grafting.

larly sliced to make an exact fit. Both are then bound together firmly, but not tightly, with raffia. If, however, the stock is much thicker than the scion, it is better to take two slices, instead of one, off the lower part of the latter, making

it wedge-shaped, and to remove from the former a corresponding wedge. To prevent any chance of slipping, the scion is often cut with a piece overhanging the wedge (see illustration), this piece fitting down on the top of the stock.

TONGUE-GRAFTING.

In tongue-grafting, scion and stock are sliced in the same way as in whip-grafting, but the precaution against slipping is rather more elaborate, the lower end of the scion being

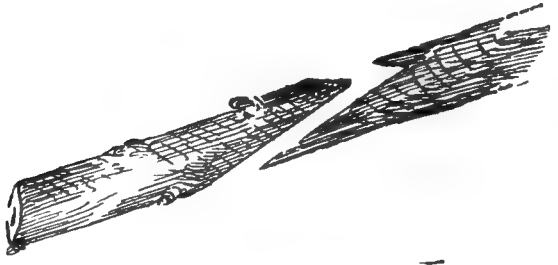

Fig. 33.—Tongue Grafting.

provided with a tongue, and the upper end of the stock with a nick, into which the tongue fits. In either method several scions may be grafted on the same stock—round the top.

CLEFT-GRAFTING.

In cleft-grafting, the stock is split for a short distance by means of a sharp axe, held in the desired position and driven in by a mallet. When the axe is withdrawn, a chisel is inserted in the middle of the cleft to force it open and keep it so. A scion, cut wedge-shaped below (as in whip-grafting), is then fitted into each end of the cleft. When the chisel is removed, the two edges of the cleft close, and hold the scion so firmly that it is seldom necessary to bind them.

Obviously, there is a gap in the middle where the chisel was, and this is the disadvantage of cleft-grafting. It may be filled in time by the callus which forms at the two junctions, but very often it does not fill completely.

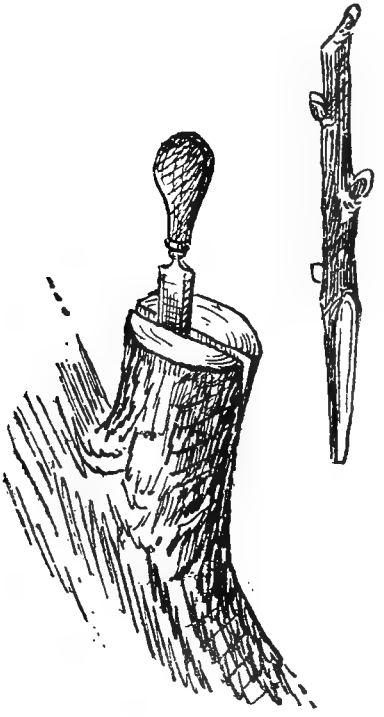

Fig. 34.—Cleft Grafting.

GRAFTING WAX.

Whatever method of grafting be adopted, the air must be excluded. Unless this is done, the sap exuding from the wounded cambium layers merely dries on the surface, instead of forming a connective layer between them. Grafting wax,

which can be obtained from any horticultural firm, should be used for the purpose. It is better than any of the home-made preparations for which recipes are sometimes given, and as the amount required is not large, it is inexpensive. The whole part, where scion and stock are fitted together, should be covered with it, especial care being taken to close with it the open cleft in cleft-grafting.

FRUIT TREES FROM SEED.

The question may be asked whether, apart from grafting, it is worth while for an amateur to propagate fruit trees. In nearly every case it is not. A fruit tree takes sixteen or seventeen years from the time the seed is sown to come to bearing. It is true that the time can be much shortened by grafting the seedling on an older stock, but even when the fertilisation of the flowers has been performed with scientific care, the results are very uncertain. The seedling may be a variety which is worth growing and naming, or it may not; the chances are that it will not be; at present we know so little about the forces involved, that the whole thing is a lottery. Now and again we may draw a prize, but for every prize there are ninety-nine blanks, if not many more.

PROPAGATION BY CUTTINGS AND LAYERS.

Propagation, by means of cuttings or layers, stands in a different position, for the resulting plants have the same characters as their parents. There are some varieties, such as Manx Codling, which root easily, but many do not. In any case, the process of growing a cutting into a tree capable of bearing a profitable crop is a slow one. A nursery firm might perhaps afford the time, the labour, and the land necessary for the purpose, but it is very rarely that an amateur can do so. He had much better buy well-grown trees and secure his fruit at once.

CHAPTER XIV.

BUSH FRUITS.

UNDER the heading of Bush Fruits may be placed Black and Red (or White) Currants, Gooseberries, Raspberries, Blackberries, and Loganberries. For the sake of convenience, Nuts are grouped with them.

CURRANTS.

Currants should be planted in November, about five feet apart, with rather more space between the rows to facilitate hoeing. At first, while the bushes are small, Lettuces, or other light crops, may be grown among them, but as this means taking more out of the ground, more should be put in. In any case, if the plants are to make strong, healthy growth, they should be dressed with manure in autumn.

PRUNING RED CURRANTS.

As Red (or White) Currants fruit on spurs, they should be pruned in the same way as was recommended for bush trees, each with six or seven strong stems, well apart from one another, all side-shoots cut back to an inch or so from the base, and the leaders shortened to four or five buds, the top one pointing outwards so as to grow away from the centre of the bush. All dead or exhausted wood should be removed; and so should suckers or young shoots from the base, unless any of them are wanted to replace old stems or to provide additional ones, in which case the strongest and best-placed should be selected for the purpose and shortened a little. The best

time to prune is the end of February or the beginning of March, according to the locality and the weather. If the operation is performed earlier, the buds left on are much more

Fig. 35.—Red (or White) Currant pruned.

likely to be damaged by birds, because there will be fewer for them to eat. If, however, crumbs are thrown out, or any other scraps which birds like better than buds, the bushes

are rarely injured. Red Currants, and also Gooseberries, are sometimes grown as cordons. In that form they produce finer fruit, but, of course, the quantity is smaller than on a bush with more bearing wood.

PRUNING BLACK CURRANTS.

As Black Currants fruit mainly on the young wood of

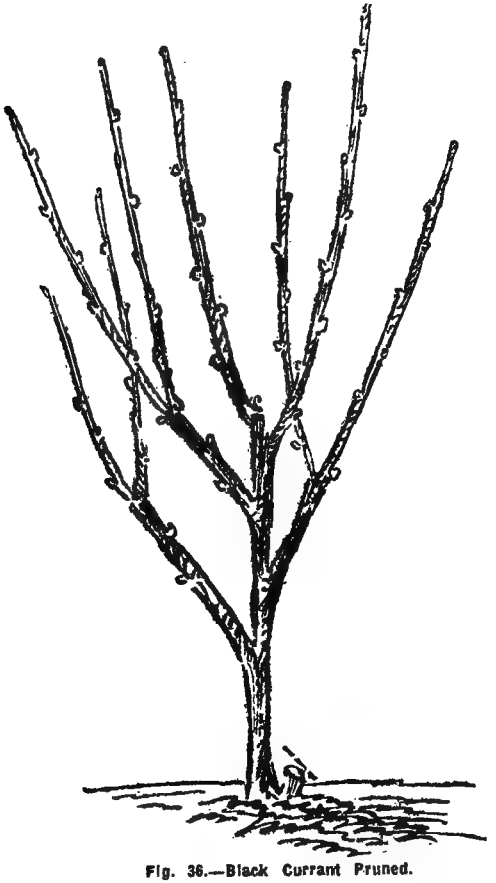

Fig. 36.—Black Currant Pruned.

the previous year, they must be treated differently. All the best of this young wood should be left at full length, and only when it is weak and crowded should it be cut. At the same time the old stems on which the young wood is borne do not last for ever, and if any of them have passed their useful stage, they should be pruned off, in order to promote the growth of younger and more vigorous stems.

PROPAGATION OF CURRANTS.

Currants of all kinds are easily propagated by means of cuttings. Young shoots taken off at a joint, with the lower

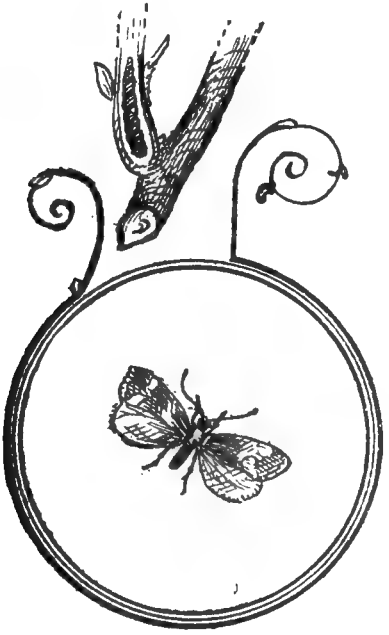

Fig. 37.—Currant Clearwing Moth. Above, grub in shoot.

buds rubbed off, should be inserted firmly in the open ground in September or October. They may be planted out in the

following autumn, or, if they do not crowd one another, left where they are for another year.

PESTS OF THE CURRANT.

The chief pests are: Currant clearwing moth, Currant sawfly, Currant scale, and Black-Currant mite, among insects, and the coral-spot disease (see page 73) among parasitic fungi.

Currant Clearwing Moth.—This insect (black, with yellow bands and transparent wings) appears in June, and lays its eggs on the Currant and the Gooseberry, the young caterpillars boring into, and eating the pith of, the shoots, which droop and die. Syringe the bushes occasionally with paraffin emulsion when the moths are about, and cut off and burn any shoots containing the caterpillars.

Currant and Gooseberry Sawfly.—The little, yellowish flies lay their eggs on the lower side of the leaves, and the tiny caterpillars (greenish, or later orange, with black heads) proceed to defoliate the bushes, afterwards descending into the earth. Pick off the caterpillars, and in winter remove or bury deeply the top two inches of soil.

Currant Scale.—The same treatment as for mussel scale (see page 57.)

Black-Currant Mite.—Too small to be seen with the naked eye, the mites live among the immature leaves folded in the buds, which consequently swell—hence the popular name "big bud"—and afterwards die instead of growing. Cut off and burn all swollen buds. Dust the bushes in March with one part of unslaked lime to two parts of sulphur, and twice afterwards, at intervals of a fortnight, with one part of lime to four of sulphur.

GOOSEBERRIES.

Gooseberries should be planted at the same distance as Currants—about five feet apart. As they fruit on the young wood, as well as on spurs, they may be pruned like either

Red Currants or Black. The bushes are liable to become dense masses of shoots unless they are thinned severely. Most of this thinning should be done in summer. Gooseberries make excellent cordons.

Fig. 38.—Gooseberry Cordon.

PESTS OF THE GOOSEBERRY.

The chief pests of the Gooseberry are the Magpie moth (see page 60), Currant clearwing moth (see Currants), Currant and Gooseberry sawfly (see Currants), Gooseberry borer, Gooseberry mite, Gooseberry scale (see mussel scale, for treatment), mildew (see page 75), and American Gooseberry mildew.

Gooseberry Mite.—When the foliage loses its green colour without any apparent reason, the presence of this pest may be suspected. It infests the lower side of the leaves, but can be seen only through a magnifying glass. Spray with paraffin emulsion, especially underneath the leaves, for which reason the syringe should have a curved nozzle.

Gooseberry Borer.—The caterpillar of a small moth (called the V-moth, because of the shape of the reddish-brown mark on each of its grey wings) bores into the berries. In May and June, when the moths are on the wing, spray the bushes with paraffin emulsion, and burn all fallen berries.

American Gooseberry Mildew.—This is one of the "notifiable diseases." If it occurs in any garden, the owner is liable to a penalty of £10, unless he at once notifies the Board of Agriculture, or its local representative, so that an expert may be sent to deal with the matter. Here, then, it is neces-

sary merely to describe the symptoms as a help to identification. About the end of May a white, cobwebby film spreads over the leaf-buds and leaves, and afterwards extends to the young shoots and fruit. When the summer spores are pro-

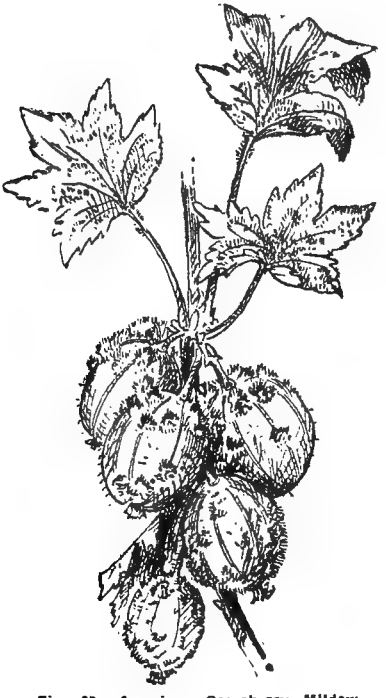

Fig. 39.—American Gooseberry Mildew.

duced, the film assumes a powdery appearance, and gradually the particles thicken and turn brown. Ordinary mildew rarely attacks the fruit, though it does so sometimes. In all cases of doubt the Board should be notified.

RASPBERRIES, BLACKBERRIES, AND LOGANBERRIES.

As Raspberries, Blackberries, and Loganberries are very similar in their habit of growth, they may be classed together. The canes of all three are biennial in their duration. They grow one year and fruit and die the next, being then replaced by young canes. When they are planted—Raspberries one foot apart, with four feet between the rows, and Blackberries and Loganberries, about eight feet apart, against a trellis or some similar support—they should be cut down to the ground, in order to strengthen the young canes which will start in spring. Unless this is done, the sap, instead of being confined to the young canes, is divided between them and the older ones which will be cut away in autumn, and, in consequence, the plants which at the same time have to form a new root-system after their disturbance, will be permanently weakened. They should be grown in rich, moist soil, for which reason a mulch of manure in summer is useful. As their roots keep close to the surface, digging among them should be avoided as much as possible. All Raspberry suckers not wanted for extending the rows or filling gaps should be removed early, and as soon as the crop is gathered the old canes should be cut down close to the ground. The young canes should be confined to six or seven to a plant, the strongest, of course, being selected. The weak unripened tips may be taken off in autumn and the canes should be tied to their supports.

Blackberries and Loganberries are generally propagated by means of layers of the young shoots. They root very quickly.

PESTS OF THE RASPBERRY.

There are three pests of the Raspberry, which deserve notice—the Raspberry beetle, Raspberry-stem caterpillar, and Raspberry spot. Blackberries and Loganberries are rarely attacked by any serious diseases.

Raspberry Beetle.—This small insect (grey or yellow, and downy) lays its eggs in the flowers, and the weevils feed on the fruit, afterwards spinning little cocoons on the canes. All infested fruit and old canes should be burned. When the flowers are opening, many of the beetles can be caught by shaking the canes over freshly-tarred sacking.

Raspberry-Stem Caterpillars.—The tiny moths (brown, with yellow spots) lay their eggs among the flowers. The caterpillars feed on the leaves, and in autumn descend by silken cords to the ground, where they hibernate, ascending the plants again in spring, to bore into the young canes at a bud. Cut off and burn any drooping shoots. In autumn and winter turn the surface soil to expose the caterpillars to birds, or bury it deeply.

Raspberry Spot.—Small, red spots appear on the canes and leaves. Many of them eventually join, the patches becoming grey in the centre. As the infected canes die instead of fruiting, they should be cut away and burned as soon as the symptoms are noticed. The others should be sprayed with Bordeaux mixture at half-strength.

NUTS.

In some gardens Nuts (Filberts, Cobs, and Hazels) are allowed to grow into trees, but in market gardens in Kent they are not very much larger than Red Currant bushes. The difference between the three kinds is slight, all of them being merely varieties of the same species. In Filberts, the Nuts are oblong, and much shorter than the husks; in Cobs, they are rounder, and about the same length as the husks; in Hazels, they are smaller, rounder still, and much longer than the husks. The male flowers, the yellow catkins, appear very early in the year, and when the pollen is ready for dispersion the small, bright-red female flowers open on buds, mostly on the twigs. Pruning should, therefore, be managed so as to

leave a sufficient number of catkins for fertilisation, and as many female flowers as possible; all wood which does not bear either being cut away completely, or else shortened, in such a manner as to induce the growth of twigs. This is best done

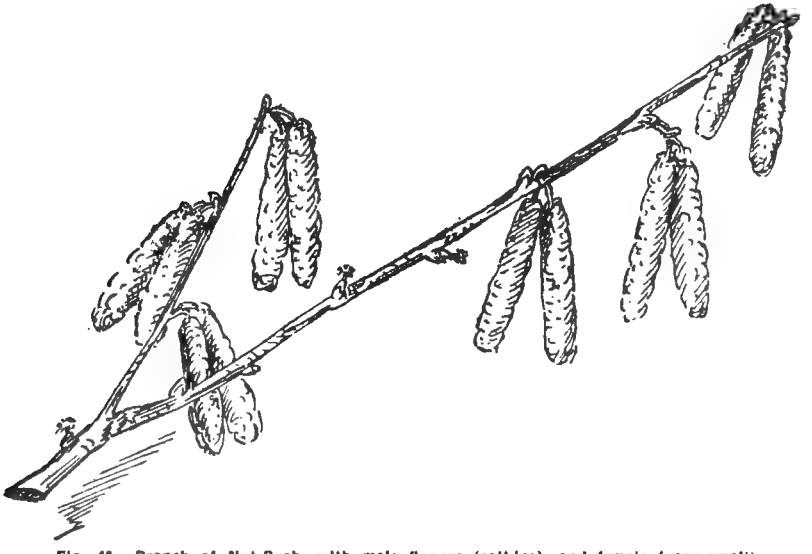

Fig. 46.—Branch of Nut-Bush, with male flowers (catkins), and female (very small).

when the flowers can be seen—about the end of March. The most convenient form of bush consists of six or seven strong stems, pruned as recommended, for Red Currants. The usual distance for planting is ten or twelve feet.

Nut Weevil.—This small beetle is the only pest likely to cause serious trouble. It pierces the shell of the nut while young and soft, and lays an egg inside, the maggot hatching about a fortnight later and feeding on the kernel. When the nuts fall in autumn the maggots leave them and enter the ground. If they are collected at once and burned there will be very few of the weevils in the following year.

CHAPTER XV.

STRAWBERRIES.

THE Strawberry is generally supposed to owe its name to the fact that straw is placed around the plants to keep the fruit clean. As it was so called long before that material was used for the purpose, the idea is obviously erroneous. The Strawberry is really the Strew-berry—in other words, the plant that strews its berries about the ground. In the earliest documents in which the word occurs it is written Streowberige.

POSITION OF STRAWBERRY-BED.

If the cultivated Strawberry were merly an improved form of the species which grows wild in this country, it would naturally be quite hardy; but it is a hybrid between a number of different species, and as one of the most important of them is a native of Chili, it requires warmth, and is liable to be damaged by severe weather. For an early crop, the best position is a slope facing south, with some protection from east winds. Later crops may have a cooler aspect, but without sunshine the fruit will not colour well, and will be deficient in flavour.

SOIL FOR STRAWBERRIES.

Plenty of moisture during the growing period is essential. Given that, the nature of the soil does not matter much, provided that it is made quite firm. If it is loose there will be an excessive quantity of foliage, with the result that there will be comparatively little fruit. Of course, light soil is liable to get very dry in summer. To guard against that

danger, and also to make good the loss of soluble food by drainage, more manure is necessary than in heavy loam.

DETERIORATION OF THE PLANTS.

Strawberries are at their best in their second and third years. In their fourth years they begin to deteriorate, and afterwards should be grubbed up. There may be plenty of fruit, but it is always small. To destroy a whole bed at one time would mean little or no fruit in the following season, and if this course were adopted the same thing would recur at intervals of four years. The best method is to dig up a fourth of the rows at one end of the bed every year, and to plant the same number of new rows at the other end. The bed then always contains some rows at their best (in their second and third years), some going off (in their fourth year), and some coming on (in their first year).

PROPAGATION.

The plants for the new rows should be obtained from the strongest runners. These are naturally the earliest that are formed. It is sometimes said that "blind" plants—those which fail to fruit—should not be used for propagation, because their offspring will be blind. But a firm of Strawberry-growers with a world-wide reputation asserts that this is not true of any variety ordinarily grown in this country, the cause of any occasional failure being merely local and temporary. Apparently, then, unfruitfulness in a single season need not be considered a drawback, though, of course, if it was persistent, that would be a different matter. As soon as a little plant with a pair of leaves is seen, it should be pegged down firmly into the ground, and the growing-point of the runner should be taken off, so as to prevent the formation of other plants, which, by dividing the sap with the first, would weaken it. If the runners are layered in small pots instead of in the ground, there is some gain, because the roots are not dis-

turbed when planting is done; but, on the other hand, there is the disadvantage that it is difficult to keep the soil in small pots moist when they are exposed all day long to the air and to sunshine. Most of the young plants, if left to themselves, would root in the ground, but they would be slower to do so than if pegged down, and time is of importance if a crop is to be obtained in the first season. When a sufficient number has been layered, all other runners should be cut off.

Fig. 41.—Strawberry runner layered in a pot, and another in the ground.

TIME TO PLANT.

If the conditions are favourable, the earlier Strawberries are planted the better. But if the ground is dry in August, it is advisable to wait for showery weather in September, or even October. The site should have been previously prepared by trenching and manuring. While such preparation is important for all crops, it is especially important for those that are to occupy the ground for four years. Trenching is recommended for Strawberries, not merely digging, for the roots go deep.

DISTANCE TO PLANT.

The usual distances for planting are from eighteen inches to two feet between the plants, and two feet between the rows

—for the convenience of gathering, rather more between every third and fourth row. In the first season this may seem a waste of ground, and those who have small gardens may, if they think fit, put the plants only one foot apart in the rows. But if this is done, every alternate plant should be dug out at the end of the first season. If the size of the bed can be increased, there is no need to throw them away. If they are lifted with soil they will make additional rows, and will fruit quite as well as those that have not been moved—sometimes even better, because of the root-pruning caused by the disturbance. If preferred, they can be potted and used for forcing.

MANURING THE BEDS.

Of course, any increase in the number of plants in a bed involves an increase in the quantity of manure which should be applied. In addition to what is dug in during the preparation of the ground, annual top-dressings are necessary. As Strawberries require a good deal of moisture, stable manure is almost indispensable for them, but it may with advantage be supplemented by artificial fertilisers, especially phosphate and nitrate. If stable manure is applied in autumn, superphosphate may be used with it at the rate of four hundredweight per acre; and if, after flowering, nitrate of soda is sprinkled between the rows—not over the foliage, which it would burn—at the rate of two hundredweight per acre, the bed should be capable of bearing a heavy crop.

PROTECTION FROM BIRDS.

It is useless to grow Strawberries unless the fruit is protected from birds. In a garden, the simplest method is to surround the bed with small-meshed wire netting, held up by iron supports or wooden posts. It should be be about six feet in height, to allow of walking between the rows without stooping. The best covering is ordinary fish netting, made

to the required size. It should be removed when the crop is gathered, so that birds can enter the enclosure and help to destroy any insects that may be present. It has a further advantage over a permanent covering of wire netting; it is not liable to be broken down by the weight of snow in winter. As Strawberry (or fish) netting is measured along the diagonals, it should be ordered one-third longer and one-third broader than the size of the area to be covered.

PESTS OF THE STRAWBERRY.

The chief pests of the Strawberry are slugs, certain beetles, eel-worms, leaf-spot, and mildew. For slugs in Strawberry-beds, there is no real remedy, except hunting for and destroying them. It is almost impossible to attract them to a trap, as they prefer the fruit to any bait that can be offered to them. The beetles eat the seeds and spoil the fruit. Many of them can be caught in old tins sunk level with the ground, and nearly filled with a solution of sugar and a few scraps of meat. Eel-worms cause distortion of the crowns, making the plants "blind." Sulphate of potash, at the rate of three-quarters of a hundredweight per acre, has been found useful, but if the trouble becomes serious, it may be necessary to burn all the plants and make a fresh bed elsewhere. For mildew, the foliage should be sprayed at once with a solution of liver of sulphur (half an ounce in two gallons of water). When the disease assumes a severe form, dry straw should be strewn about the bed in autumn and set alight. This will burn the leaves, but not injure the crowns. As the same species of mildew attacks various wild plants, such as the Hop, the Meadowsweet, and the Willow-Herb, they should not be allowed to grow near Strawberries. The method of burning the foliage may also be employed for leaf-spot, a very common disease, easily identified by the reddish-brown spots on the leaves.

CHAPTER XVI.

VINES.

VINEYARDS were once common in England, and there still are several in the western counties; but our climate is so uncertain that, when vines are now planted in the open air, they are trained against south walls, and even in this position, it is only in a warm summer that the hardiest varieties are able to ripen a crop. In this chapter, therefore, it is assumed that they are cultivated under glass, though not necessarily with artificial heat, for several excellent varieties, notably Black Hamburgh, the best for an amateur, can be grown quite well in a cold greenhouse which gets plenty of sunshine—preferably a "lean-to" against a south wall.

PREPARATION OF A VINE BORDER.

The border may be either inside or outside the house. Unless forcing is to be carried on, an outside border is the better, because there is less risk of its getting excessively dry, and also because it is fully exposed to air and the sunlight. The usual method of preparing it is to excavate to the depth of about two feet; to put in a layer of broken bricks as drainage; to place turf upside down on the bricks, so as to prevent the spaces from being filled, and, when the turf decays, to provide additional food; and, finally, to return the soil mixed with decomposed manure, ash from the rubbish bonfire, crushed bones, and, if it is inclined to be clayey, road scrapings (but not from tarred roads). In order to run off heavy rain, the border should slope gently downwards from the greenhouse wall to a path. Its width should be about twelve feet.

and if it is intended to fill the house with vines, it should run the whole length of the wall, or slightly beyond it. In that case they should be planted about five feet apart. A greenhouse, fifteen feet long, would therefore hold three vines ——the first two and a half feet from one end, the second five feet from the first, and the third five feet from the second, and two and a half feet from the other end. If the vines are to be grown with more than one rod apiece, the distance between them should be proportionately increased.

PLANTING A VINE.

As they are usually bought in pots they may be planted at almost any time. As a rule, October is the best month.

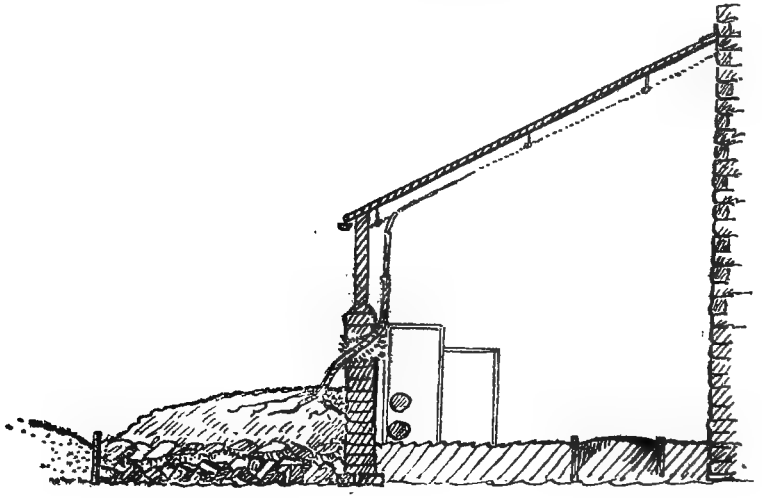

Fig. 42.—Vine planted in outside border.

The ground should be made quite firm afterwards, the surface should be loosened with the hoe, and a mulch of manure should be laid over the roots to protect them. It is advisable to apply the mulch every autumn, but it should be removed early in

spring, in order to let the warm sunlight reach the ground. A brick or two should be taken out of the greenhouse wall, and when the rod has been passed through, the space around it should be stuffed with dry straw, which will serve a double purpose—prevent fraying of the bark against the edges of the brickwork, and exclude the cold air. The vine should then be shortened to a strong bud, three or four feet from the base. Unless this is done some of the buds may not break, and in any case it is necessary to restrict growth until there are plenty of roots to support it.

THE FIRST YEAR AFTER PLANTING.

In its first year the young vine will grow as a single, straight rod, without laterals (side-shoots). It should be tied to the wires—under, not over, them, so that it can be taken down when necessary—and should be allowed to extend unchecked. The wires are sometimes too close to the roof. If they are less than nine inches from it, some of the leaves press against the glass, and the sun's rays shining on their moistened surfaces cause scorching. A bunch or two of flowers may develop, but should be taken off. In summer the lights should be opened freely, and from the middle to the end of the season, in order to ripen the wood, they may be left open at night as well as during the day. After the leaves have fallen, the rod should be cut back to five or six feet. Pruning should always be done at this time. If it is delayed so long that the wounds cannot heal before growth commences, the result will be "bleeding"—that is, loss of sap. Though this can be stopped by means of a styptic, it is very much better to avoid the necessity for anything of the sort.

MANAGEMENT IN LATER YEARS.

In each subsequent year the vine should be allowed to make some additional length until the back wall is reached.

No further extension is then possible, and growth must be confined to the laterals, which will, in the second year, issue singly from the buds along the rod. At about the third leaf

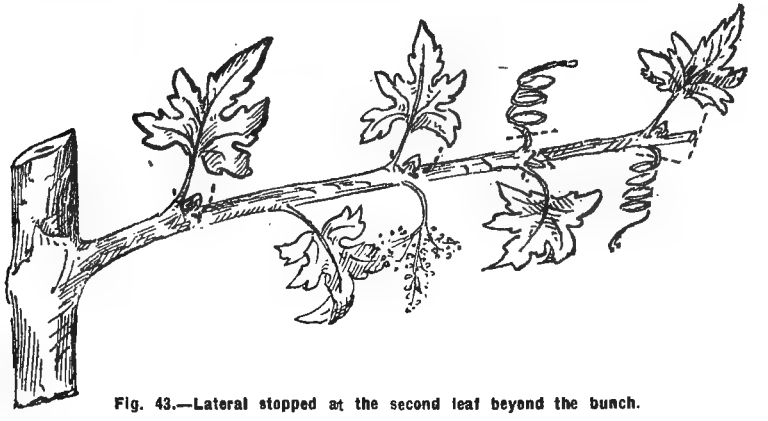

Fig. 43.—Lateral stopped at the second leaf beyond the bunch.

on each lateral a bunch of flowers will be produced, and at the second leaf beyond the bunch the shoot should be "stopped"—that is, the end should be pinched off. Laterals

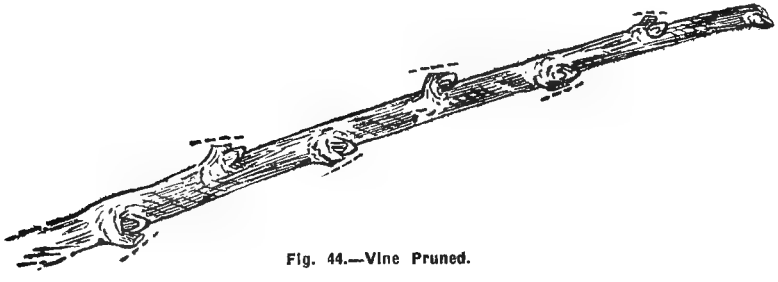

Fig. 44.—Vine Pruned.

which do not bear bunches should be treated in the same way—be stopped at about the fifth leaf. One result of the stopping will be to cause the buds in the axils of the leaves to grow, and these fresh shoots (sub-laterals) should either

be taken off entirely, or else, if there is space for more foliage, stopped at the first leaf. It is important to remember that the size of the grapes depends largely on the size of the leaves, and not on their number. They should, therefore, not be allowed to crowd one another. At the end of the season, when the leaves have fallen, each lateral should be cut back to the first bud, if a good one, thus forming the commencement of a spur. If more buds than one are left each time the pruning is done, the spurs soon get very long and unsightly.

THINNING AND TYING THE LATERALS.

After the second year two or more laterals will probably grow where there was originally only one, and they will have to be thinned out. The general rule is one lateral to a spur, and one bunch to a lateral. For a time, however, two laterals may be allowed to remain, until it can be seen which carries the bigger bunch, and until that one is safely tied down to the wires. The operation is one requiring considerable care, for the young shoots are very brittle. As the wires are rarely close enough together, raffia is stretched btween them, and when this is done an excessive strain may be thrown on some shoot which had previously been far from tight. To avoid accidents, it is necessary to proceed gradually with the tying down—to bend down the shoots only a little at a time, and to increase the strain as they become accustomed to it. If the only one on a spur does snap off there may never be any more growth on the spur. Hence the advantage of leaving a second one temporarily.

TO MAKE THE BUDS BREAK EVENLY.

The same thing may happen if the buds on a spur fail to break. This is most likely on some of the lower spurs, for the sap current sweeps past them and exerts the greatest effect at the upper end. A failure of this kind can usually be prevented by taking down the rod from the wires before

growth commences, and slinging it in a horizontal position, or with its end slightly downward. The buds will then break regularly along its whole length, and when they have done so it can be tied up again.

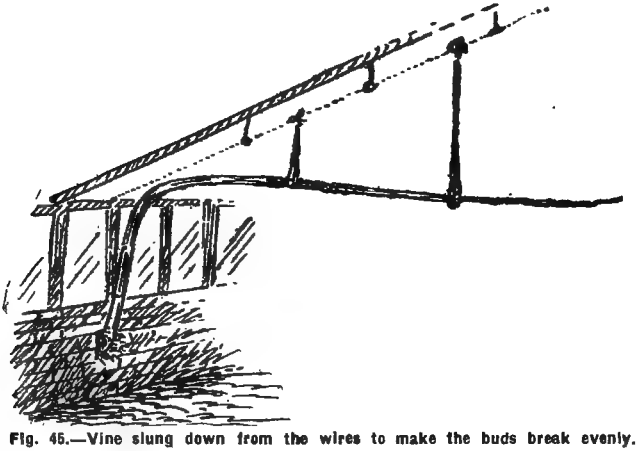

Fig. 45.—Vine slung down from the wires to make the buds break evenly.

MANAGEMENT OF THE BUNCHES.

Many varieties set their fruit readily, but others need some such assistance as tapping the rods, in order to scatter the pollen. The berries swell rapidly until the seeding stage is reached; then there is a pause, and afterwards growth is resumed. Thinning should commence while they are quite small. Except in very small bunches, probably two out of every three grapes must be sacrificed, but, until experience has been gained, it is safest not to cut out very many at one time, always bearing in mind the fact that the shape of each bunch must largely determine what should go and what should remain. It is useless leaving any berries in the centre, as they will not colour. A smooth-pointed stick should be used for separating the difficult parts of a bunch to facilitate thinning. Touching them with the hands causes "scalding"—

hard, smooth patches on the skin. As growth proceeds, the shoulders of the larger bunches should be tied out to the wires.

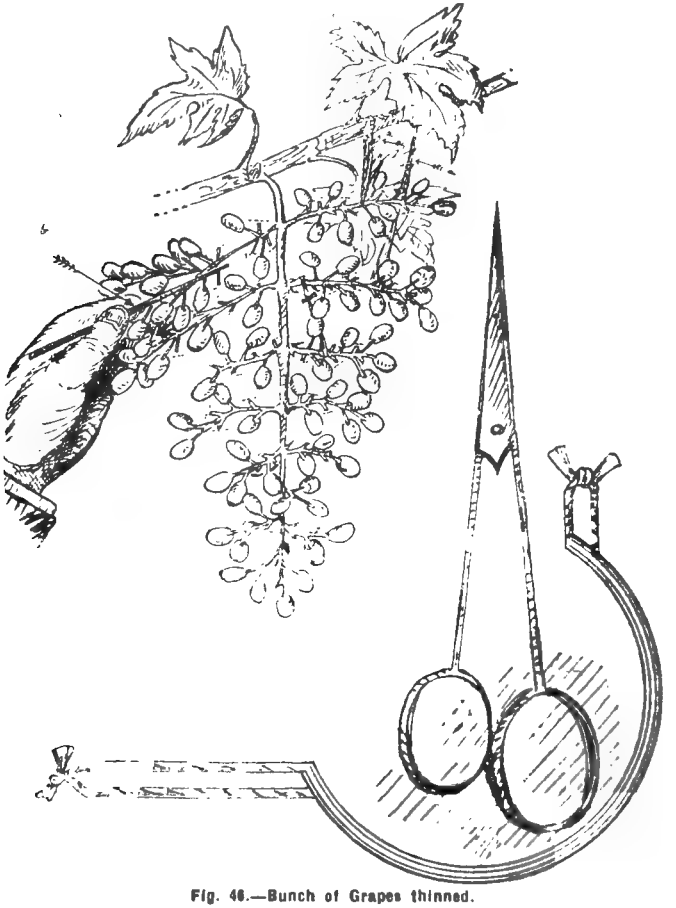

Fig. 46.—Bunch of Grapes thinned.

This gives more space and more light to those underneath, and reduces the number which have to be cut out. The aim shou'd be to get firm, solid bunches, as large as possible, the

berries so arranged that they are not too tight, but just able to attain the maximum size. The atmosphere, kept rather moist during the period of growth, should be allowed to get drier as ripening proceeds, and for good colour and flavour sunshine and fresh air are essential.

PROPAGATION.

Vines can be propagated by means of single buds, cut as shown in Fig. 47. They should be inserted firmly in pots of sandy soil in January or February, the top of each bud just showing at the surface. Though artificial heat is

Fig. 47.—A Vine Eye cut for propagating. Below, it is shown rooted and growing.

not absolutely necessary, it will lessen the number of failures and hasten the formation of roots. When larger pots are required, the rooted eyes, now grown into small shoots, should be transferred to them without disturbance of the soil. They

should be provided with plenty of food and water, so as to keep them growing strongly throughout the season, and at the end of that time some of them should be large enough for planting out.

PESTS OF THE VINE.

The chief pests of the vine in this country are mealy-bug, red spider, thrips, and various weevils, among insects, and black rot, Grape rot, and mildew (American downy-mildew, as well as the ordinary form), among fungoid diseases. The phylloxera, a species of aphis, which causes galls on the leaves, and also on the roots, is exceedingly destructive on the Continent, but comparatively rare in Britain. No cure is known. To prevent its spreading, infected vines should be uprooted and burned.

Insect Pests.—White, woolly tufts indicate the presence of mealy-bug. The brown, scale-like insects should be destroyed with spirits of wine, applied with a brush. If they are numerous, all loose bark should, in autumn, be rubbed off the rods, which should then be painted with paraffin emulsion. Red spider affects the foliage of the vine in the same way as it does that of fruit trees in the open air, turning it a sickly, mottled colour. It is never troublesome unless the air has been kept excessively dry. Frequent spraying is useful, but should be discontinued as soon as the Grapes begin to colour. A solution of liver of sulphur, though effective out of doors, is unsuitable for a greenhouse, as it blackens paint. The best and simplest remedy for red spider, and all other insects, is vaporisation at intervals. There are various preparations on the market; they are inexpensive and easily managed. Vaporisation will also destroy thrips, small, black insects closely related to aphides. As the weevils mentioned feed on the roots, they are difficult to get rid of, but in the beetle stage they attack the foliage, and can then be shaken down on to tarred paper.

Fungoid Diseases.—In black rot, dark spots appear first on the leaves, and then on the berries, which shrivel and harden. Spraying with Bordeaux mixture at half-strength, just after

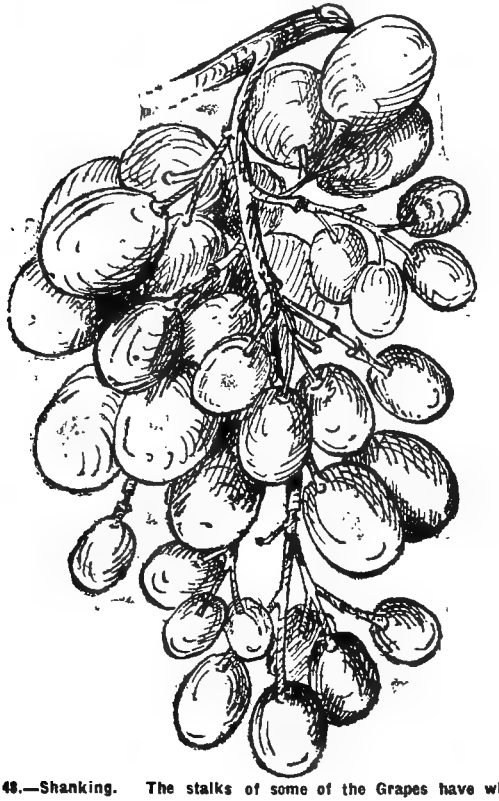

Fig. 48.—Shanking. The stalks of some of the Grapes have withered.

the buds break, and once or twice afterwards, has been recommended. In Grape rot (anthracnose), the spots are grey, with a dark edge. They appear on the leaves, shoots, and berries. As this disease spreads rapidly, infected berries should be cut off and collected, not left lying about on the floor, and flowers

of sulphur should be dusted over the leaves and shoots while damp. Mildew, easily recognised by the whitish powder on the foliage, is caused by excessive moisture, and lack of fresh air. Here, too, flowers of sulphur will be found useful. But in a heated house it is most effective when sprinkled on the pipes. This may be done for black rot and Grape rot, and for red spider.

SHANKING.

It sometimes happens that the stalks of portions of the bunches, or, in bad cases, of whole bunches, wither, the Grapes in consequence shrivelling and turning brown. This is called "shanking." It is not a disease; it is merely a sign that the roots are unequal to the task which has been set them. Either there is something wrong with the border in which they grow—the soil may be exhausted, or excessively dry or wet, or they may have got down into the subsoil—or the crop is too heavy for them. The affected berries are naturally those which receive the smallest supply of food. If they are not the farthest away from the sap-current—at the tips of the bunches—they are badly placed for getting their fair share. The gardener should set to work to discover the cause, and should remedy it as soon as possible. The Grapes on the stalks which have begun to wither cannot be saved, and should be cut out.

FRUIT-GROWER'S CALENDAR.

JANUARY.

Apples, Pears, Plums.—Plant in mild weather; prune. Nail in trees on walls, renewing all old bands.

Currants and Gooseberries.—Insert cuttings in the open ground.

Strawberries.—After frost any recently-planted runners that have been loosened in the ground should be made firm again.

Vines.—Propagate by means of single eyes.

FEBRUARY.

Apples, Pears, Plums.—Planting should be completed as soon as possible. Any trees which are to be grafted should be headed back, and suitable shoots for scions should be selected, and laid in soil under a north wall.

Apricots, Nectarines, Peaches.—Prune and nail in. Spray Peaches which were attacked by leaf-curl in the previous year.

Currants and Gooseberries.—Prune towards the end of the month.

Vines.—If there is any doubt about the buds breaking evenly, the rods should be slung down horizontally from the wires.

MARCH.

Apples, Pears, Plums.—Stir the surface soil round the trees. Graft.

Apricots, Nectarines, Peaches.—Prune and protect opening flowers by means of netting.

Black Currants.—Dust with lime and sulphur bushes showing "big bud."

Nuts.—Prune.

Strawberries.—Hoe in dry weather.

Vines.—Rods slung down from the wires should be tied up again after the buds burst. Spray occasionally on sunny days.

APRIL.

Apples, Pears, Plums.—Continue grafting. If bees are few, fertilise the blossoms by hand. Hoe all fruit crops as soon as possible, not only this month, but also throughout the summer.

Apricots, Nectarines, Peaches.—Nets used to protect the blossom should remain until May. Thin Apricot shoots.

Black Currants.—For "big bud" repeat last month's application.

Figs.—Prune.

Vines.—Admit more air. When the flowers open, tap the rods to scatter the pollen. Thin out laterals. If mealy-bug is present, apply spirits of wine with a brush. Remove winter mulch from the border and stir the surface soil.

Insects and Diseases.—Destroy nests of lackey-moth caterpillars, and spray for Apple sawfly, Pear midge, brown rot, and gummosis.

MAY.

Apples, Pears, Plums.—Thin crowded shoots. Manure either as a mulch, or in liquid form, may be applied to trees on which the fruit is set when the crop is heavy.

Apricots, Nectarines, Peaches.—Shorten fore-rights of the two first to form spurs, and remove them from Peaches.

Currants and Gooseberries.—Cut away suckers. American Gooseberry mildew makes its appearance in April or May.

Loganberries and Blackberries.—Propagate by layering the young shoots.

Raspberries.—Thin out the weakest of the young canes when there are more than six to a stool. Hoe and mulch.

Vines.—Thin out, shorten and tie down laterals. Spray occasionally. For fungoid diseases, sprinkle flowers of sulphur on the damp foliage, or on the pipes if they are heated; for insects vaporise.

Insects and Diseases.—Spray for aphis, Pear-leaf blister mite, and caterpillars of the lackey-moth, small ermine moth, magpie moth, vapourer moth, and Gooseberry borer; also for mildew. Look out for the caterpillars of the Currant and Gooseberry sawfly, and tie bands of sacking round Apple trees to trap caterpillars of the codling moth, and examine them frequently.

JUNE.

Apples, Pears, Plums.—Cut off suckers. Remove the ties from trees grafted in March. Shorten side-shoots to form spurs.

Apricots, Nectarines, Peaches.—Water and spray in dry weather. Apply liquid manure. Thin fruit.

Currants and Gooseberries.—Thin shoots; also some of the fruit on Gooseberries if the crop is heavy. Pick off caterpillars.

Loganberries and Blackberries.—Tie up the young shoots.

Strawberries.—Hoe at the beginning of the month to destroy all small weeds; then place straw round the plants and hang up netting. Where beetles are troublesome, tins of syrup should be sunk in the ground. Liquid manure will improve the crop.

Vines.—Thin the bunches, stop the shoots, and rub off all superfluous growth. Apply liquid manure.

Insects and Diseases.—Spray for aphides, mussel scale, red spider, Pear and Cherry sawfly, and caterpillars of the brown-tail moth and Currant clearwing moth. For Raspberry spot, burn the affected canes, and spray the others. Inspect Gooseberries for signs of mildew.

JULY.

Apples, Pears, Plums.—Thin heavy crops and apply artificial manure. Shorten side-shoots if this has not been yet done.

Apricots, Nectarines, Peaches.—Give liquid manure after stoning.

Figs.—Thin out shoots.

Gooseberries.—Thin bushes; cut back laterals on cordons.

Vines.—Continue thinning the bunches.

AUGUST.

Apples, Pears, Plums.—Gather all fruit as soon as it is ripe, and be careful not to bruise it. Protect choice fruits from birds and wasps by means of muslin bags.

Currants.—Black Currants should be picked as soon as they are ripe, otherwise they shrivel.

Raspberries.—Cut out old canes after fruiting, and thin and tie up the young.

Strawberries.—Prepare the ground for new rows, and plant in showery weather.

Vines.—Finish thinning the bunches. The air should be kept drier after colouring commences, and the ventilators should be opened as much as possible.

SEPTEMBER.

Apples, Pears.—Towards the end of the month, lift or

root-prune trees growing with such excessive vigour that they do not flower.

Currants and Gooseberries.—Propagate by cuttings.

Figs.—Root-prune if growth is excessive.

Raspberries.—See last month.

Strawberries.—Plant.

OCTOBER.

Apples, Pears.—Continue lifting and root-pruning. Fruit intended for keeping should be laid thinly on airy shelves, where it will be safe from frost. Order fruit trees of all kinds and trench the ground in preparation for planting them.

Peaches and Nectarines.—Cut away old bearing wood.

Vines.—Prepare the border, and plant either this month or next.

Insects.—At the beginning of the month tie grease-bands round Apple trees to trap the codling moths.

NOVEMBER.

Apples, Pears, Plums, etc.—Plant new trees. Prune, cutting back to two buds side-shoots shortened in June or July. Fork over the ground, and manure when necessary, applying potash and phosphate, or stable manure. Prune trees on walls.

Apricots, Nectarines, Peaches.—Plant.

Currants, Gooseberries, Raspberries, etc.—Dig, manure, and plant; cut out old canes of Loganberries and Blackberries.

Nuts.— Plant.

Vines.—Prune as soon as the leaves fall. If the rods are infested with mealy-bug, rub off the loose bark and paint with paraffin emulsion.

Insects.—Dress the ground for Plum weevils, and destroy the nests of the brown-tail moth, the egg-bands of the lackey-moth, and the cocoons and eggs of the vapourer moth. Examine grease-bands for the codling moth, and, if necessary, grease them afresh.

DECEMBER.

Apples, Pears, Plums, etc.—Plant, but not during severe frost.

Currants, Gooseberries, etc.—Dig and manure if this has not been done.

Strawberries.—Mulch.

Insects and Diseases.—Spray for mussel scale, oyster-bark scale, Apple-blossom weevil, Apple sucker, codling moth, Apple and Pear scab, brown rot, and other fungoid diseases. For Pear midge, remove and bury deeply the top soil round the trees.

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