THE THOMERY SYSTEM

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THE THOMERY SYSTEM
OF
GRAPE CULTURE.

FROM THE FRENCH.

By M. DU BREUIL.

NEW YORK:
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1874

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THE THOMERY SYSTEM OF GRAPE CULTURE.

(This is the famous system under which the splendid Chasselas de Fontainebleau Grapes are produced; it is the method advocated by Dr. Grant. The account is literally translated from Du Breuil's *Cours d'Arboriculture*, and is the only complete account which can be found—at least so says the Frenchman, Rendu, in his "*Ampelographie Française*," and he ought to know.)

	PAGE
Cultivation of the Vine upon Trellises, in Northern and Central France, according to the New Methods in use at Thomery,	5
Form to be given to the Trellises,	7
Horizontal Cordon of Thomery,	9
Horizontal Cordon of Charmeux,	13
Vertical Cordon,	15
Vertical Cordon with alternate Shoots,	16
Cultivation of Trellised Vines arranged in the form of the Vertical Cordon with opposite Shoots,	19
Walls proper for the Trellis,	19
Exposure of the Walls,	22
Propagation of the Vine,	22
Graft,	24
Plantation and Process of Bedding or Laying the Trellised Vine—	
First Year,	25
Second Year of the Plantation,	29
Third Year,	30
Method of Pruning adopted for the Vertically Trellised Vine with opposite Shoots—Construction of the Frame—First Year,	33
Second Year,	36
Third Year,	33
Fourth Year,	39
Care necessary to the Lateral Branches—First Year,	40
Disbedding the Lateral Branches or Ceursons,	43
Pinching the Shoots,	44
Manner of fastening the Shoots in Summer,	45

	PAGE
Renewal of the Coursons,	45
Replacement of the Spurs (Coursons),	46
Care of the Grapes,	46
Suppression of the Superfluous Branches,	46
Thinning the Branches,	46
Gathering the Leaves,	47
Protections,	48
Annular Incision,	48
Renewal of the Trellised Vine,	48
Culture of Table Grapes in the Open Air,	51
Culture of Table Grapes in Southern France,	52
Diseases of the Vine—Destructive Animals and Insects,	53
Gathering and Preservation—Fresh Grapes,	55
Dried Grapes—Raisins,	59

CULTIVATION OF THE VINE UPON TRELLISES (EN TREILLE) IN NORTHERN AND CENTRAL FRANCE, ACCORDING TO THE NEW METHODS IN USE AT THOMERY.*

THE table grape cultivated in the open air acquires often in Central, and with greater reason in Northern France, only an imperfect maturity and mediocre quality, for want of proper and sufficiently prolonged heat during the summer. The vine starts with vigor, but its growth is too much prolonged, and the ripening is not completed by the first cold weather of the autumn; for it is only when the sap channels cease to feed the clusters that the grape begins to ripen. This prolonged vegetation is also the reason why the shoots are but imperfectly formed, or matured by the August heat, and why the vintage of the next year is less abundant. To avoid this cause of failure, the vine is disposed in the form of a *trellis*, upon walls placed so as to enjoy the best exposure, and soils are chosen of a light or medium nature, which are easily drained and warmed; lastly a series of operations is applied to the vine, the result of which is to maintain it in a state of moderate vigor, and above all to diminish the period of its yearly vegetation. The trellis of the Château of Fontainebleau was the first which, in its culture, taken as a whole, best fulfilled the

* The first trellises at Thomery were established about 120 years ago by a cultivator named Charmeux, grandfather of the present M. Baptiste Rose Charmeux. He built the first wall for the purpose, leaving in the centre, according to a condition imposed upon him, a gate for the passage of the chase.

conditions which we have just indicated, and it has been chosen for a model by all the authors who have written upon the cultivation of the vine *en espalier*. This trellis, 1,500 yards in length, was put up nearly a century ago, and was restored about the year 1809 under the direction of Monsieur Lelieur. But long before the last named period, the inhabitants of Thomery, a village five miles distant from Fontainebleau, were adopting entirely this method of culture. They found in it so much advantage that they finished by covering with walls intended for the vine the greatest part of the territory of the Commune.

This culture at the present time extends over more than 3,200 acres, and produces on an average a million kilogrammes of grapes. It is the delicious produce of these trellises which are sold at Paris under the name of *Chasselas de Fontainebleau*, Fig. 1. Encouraged by their success, these intelligent husband

Fig. 1.

men have continued to perfect their processes, and the greater part of their trellises are at the present time arranged and maintained much better than those of Fontainebleau. The reader, however, would be in error should he believe that the success of this method at Thomery is due to the soil, to the climate, or to the exposure of this locality being particularly suitable to the vine. The soil through most of the commune is of a clayey nature, and retains a slight dampness unfavorable to the quality of the grape. The ground is generally inclined to the north-east, and, lastly, the neighborhood of the forest, by which the commune is surrounded on one side, and that of the Seine, by which it is bounded on the other, maintain a humid atmosphere very injurious to the vine.

It is chiefly to the skill of the cultivators that we must attribute such happy results. We shall, therefore, describe the mode of culture practised by them, and recommend it for the climate of the centre and the north of France.

FORM TO BE GIVEN TO THE TRELLISES.—The form the most commonly adopted until quite lately has been that of a simple

Fig. 2.

horizontal branch (*en cordon horizontal simple*), Fig. 2. It is the best form for allowing the action of the sap to spread

equally toward all points of the plant, and at the same time it occupies without loss of space all the surface of the wall. But these cordons, *or arms*, must be subjected to certain conditions.

First. The two arms should present exactly the same length, or else it will be seen that the longer arm will absorb the greater part of the sap and soon destroy the shorter. Moreover, the shoots which these arms bear should spring only from the upper surface and at regular intervals of from seven to eight inches.

Second. The entire length of the arms developed by the same stock should not pass certain limits, for if they are permitted, as is often the case, to attain a length of from 32 to 48 feet, the sap tends principally toward the extremities, the shoots growing upon these points are too vigorous, while those nearer the origin of the arms become feeble and finally wither. It is much more profitable to increase the number of stocks against the walls, and to concentrate the action of the sap in a less extent of branches. In light soils and to varieties of ordinary strength, an average length of 52 inches is given to each one of the arms (or cordons) of the same stock. This, in very fertile soils, may be increased to 66 inches. With respect to very hardy varieties, as the Frankenthal, a length of from 78 to 97 inches is allowed. That adopted at Thomery is commonly 93 inches.

Third. The same stock should not bear many cordons one above the other, for the sap tending principally to the upper cordons, those beneath will remain weak.

Fourth. In many gardens may yet be seen vines fixed to the upper part of walls against which are trained different sorts of fruit trees. This is a very bad arrangement. If the cordon is placed in the most favorable condition for ripening the grape, that is 19 inches lower than the coping of the wall, the foliage of the vine shadows the trees trained below and condemns from 11 to 15 inches of their tops to complete sterility. Moreover, they deprive these trees of the influence of the rains and dews of summer. If, in order to avoid these inconveniences, the cordon is placed above the coping of the wall, it is only with

great difficulty that the clusters, no longer protected, arrive at maturity. It is better, then, entirely to abandon this arrangement, to devote a certain space of wall to the vine, and to proceed in such a manner that this shall be entirely covered. This is what has been done for the trellis of Fontainebleau, and those of Thomery, by means of the following forms.

HORIZONTAL CORDON OF THOMERY. Fig. 3.—Each vine-stock taken by itself presents exactly the arrangement of the simple horizontal cordon. That which constitutes the Thomery system is the position of the cordons with regard to each other. The wall is covered from summit to base with cordons of the same length placed one over the other, and supplied by vine stocks planted at regular distances.

To construct this trellis we first determine the distance to be preserved between each *cordon*. As the space is to be filled by shoots which spring from the upper surface of the cordons, it should be such that the shoots may reach a development sufficient to maintain the requisite degree of strength in the vine, without, however, passing the upper cordon, for it would, in that case, be shaded too much. Experience has shown that a distance of from 17 to 20 inches is, in the greater number of cases, sufficient, and that to this height the shoots may be deprived of their buds without diminishing the strength of the vine. This distance, may, however, be augmented for very hardy varieties in very fertile soils by from 4 to 6 inches. Monsieur Felix Malot has established at Montreuil a trellis, the cordons of which being placed at a distance of only 15 inches from each other, render it necessary to stop the shoots as soon as they have attained that length. The sap from the roots being concentrated in a smaller space, he obtains, in general, larger bunches; but this detracts from the strength of the vine and the duration of the trellis, and the growth of the grapes occupying a longer period, they do not ripen so well. The cultivators of Thomery prefer smaller bunches more equally ripened. It will next be proper to decide the height of the wall, that we may know the number of cordons to be erected. Supposing that, like almost all those of Thomery, this wall is $8\frac{1}{2}$ feet in

Fig. 3.

height,* by dividing this number by 17 inches (the distance of the cordons from each other), we obtain just six inches. The first cordon being established at 15 inches from the ground, we shall then be able to place upon our wall five cordons.

As to the distance to be preserved between the stocks, that is necessarily determined—first, by the length to which the two arms are to be allowed to grow; and secondly, by the number of cordons one above the other. Let us suppose this number to be five, and the total length of the two arms to be 8 ft. 10 in. To know the distance sought, divide the total length by the number of cordons: we obtain 20.12 inches, which we have adopted for our figure. At Thomery, where the cordons have only a length of 88.8 inches; the stocks are planted at intervals of seventeen inches. It might happen that the wall for the trellis might be less than $8\frac{1}{2}$ feet in height, and that the number of cordons being reduced from five to three, the distance between the stocks will then be 33.99 inches. But an interval so great exposes the trellis to a degree of growth prejudicial to the ripening of the grape; in that case it would be better to diminish the length of the cordons from $8\frac{3}{4}$ to 5.87 feet, and the distance between the stocks will then be 19.76 inches. It may also be that the wall will be more than $8\frac{1}{2}$ feet in height, and in order to increase the number of cordons it becomes necessary to place the stock at less than 20.12 inches; for example, to 9.88 inches if the wall affords space for ten cordons. Should this distance be too small to allow the roots to draw from the earth the sustenance necessary for the support of ten cordons, in order to remedy this inconvenience the length of the cordons is slightly increased for a trellis of ten cordons to from 103.08 inches to 62 inches, the stocks remaining at the distance of 15 inches from each other. However, as this increased length of the cordons has an unfavorable

* M. Du Breuil has had his drawings made to an accurate scale, but although our figures are exact transfers from his cuts, the relations of the French and English measures is such as to preclude our giving a useful scale in English feet. The same reason has obliged us to introduce numerous fractions—a feature which we did not feel at liberty to avoid by violating the accuracy of the translation.

influence over the vigor of the branches and the quality of their products, we recommend in preference that the following process be employed.

It consists in planting on the side of the wall which is to

Fig. 4.

receive the trellis only the number of stocks sufficient to form five cordons, at the most. As to the other five cordons, if the height of the wall requires ten, they should be established by means of stocks planted *on the other side* of the wall, and which may pass to the front through holes pierced in the wall at each point where a cordon is desired (Fig. 4). When the vines have grown through the wall, the opening should be closed with clay in order to avoid injurious currents of air. The cordons formed in this manner are preferred by the cultivators of Thomery for the lower cordons of the trellis. They have remarked that the vines planted on the shady side of the wall present a stronger growth than the others, doubtless because the soil is less dried by the heat of the sun, and that the greater part of their stems escapes the action of the solar rays. Should these vines form the upper cordons, the size and abundance of their leaves would injure those below. In placing them, on the contrary, on the lower part of the trellis, their too great growth is diminished, and their clusters nearer the ground are subject to a more elevated temperature, by which their ripening is hastened.

This ingenious method may also be used for trellises composed of five cordons, but which are placed in a soil so dry and

scorched that the distance of 20 inches between the stocks is not sufficient to allow the roots to gather from the earth the nourishment required. This distance must then be increased, without however augmenting the length of the cordons.

When the position to be given to the cordons is properly determined, the plan of their arrangement is traced upon the wall. Begin by indicating at the foot of the wall from A to J (Fig. 3) the point from which each shoot should spring, and from that point draw a vertical line.

At the point A, this vertical line ceases at the height of the first cordon at 15 inches from the soil; at the point B, 33.08 inches; at the point C, at 50 inches, and as far as the point E, where the line of the first cordon ceases at 86 inches from the soil. From thence a second series of lines is commenced similar to the first, and we proceed in this manner to the end of the wall. It then only remains to trace, touching the top of each vertical line, the course to be taken by the cordons from right to left, and to indicate where each of them is to cease—that is to say, at 52 inches from each side of the main stalk. After the conclusion of this operation, the vines are planted in the manner which we intend to describe.

HORIZONTAL CORDON OF CHARMEUX (Fig. 5).—The arrangement which we have just explained is that which was at first generally adopted for the Thomery vines, and is that which is still employed for the trellis of Fontainebleau. But it was not long before the cultivators of Thomery remarked that this method presented an important inconvenience. During the formation of the cordons, an entire arm of each stock is shaded by the upper cordon, while the greater part of the opposite arm escapes this unfavorable influence. The result is an inequality of growth between these two arms, and it becomes necessary to employ certain processes, often unavailing, to maintain a proper equilibrium of growth between the two arms from the main stalk. To obviate this difficulty, in 1828, M. Charmeux, senior, invented a new description of horizontal cordon, which has been adopted by almost all the cultivators of Thomery for the trellises which they have since erected. The plan is as follows:

Fig. 5.

- * The distance between the superposed cordons, the length of the latter, and the distance between the stocks, is the same as in that of the horizontal cordon of Thomery. The Charmeux cordon differs only in the order in which the stalks successively put forth the cordons forming the trellis. Thus, in the Thomery cordon, the first stalk (A, Fig. 3), produces the first lower cordon; the second stalk (B) the second cordon, and thus to the highest cordon of all, in such a fashion that the whole number of stalks form, from one extremity of the trellis to the other, a succession of distinct steps. On the contrary, in the cordon of Charmeux, (Fig. 5), the first stalk (A) furnishes the first cordon, the *second* (B) the *fourth*, the *third* (C) the *second*, the *fifth* (E) the *third*, to commence again by the first cordon, and continue in the same manner to the end of the trellis.

The design of this trellis upon the wall is made as easily as for the preceding arrangement.

The desired purpose of this contrivance is completely attained. Not only the cordons are not unequally shaded, during the first years of their growth, but they completely escape this influence until the age of about five years. If then they are subjected to this shade, it is equal for both arms, and is brought first to bear upon the ends of each cordon in such a manner as to moderate their growth to the advantage of the bearing shoots nearest to the main stalk.

VERTICAL CORDON.—This disposition, to which, absurdly enough, the name of "palmette" has been given, has been applied to the trellises of Fontainebleau to a small extent for about forty years, and ten years later to some trellises at Thomery. The following is the principle. The vines, planted 39.37 inches apart, are allowed to develop a single stalk, which rises vertically to the top of the wall. This stalk presents on each side a series of branches irregularly disposed. The shoots annually developed from these are trained obliquely in the space by which each main stalk is separated.

This system of is susceptible many improvements. It is evident, for example, that the interval of one metre ($39\frac{1}{2}$ inches)

which separates each main stalk, is too great when the shoots are trained obliquely and not perpendicularly from the main stalk upon which they grow, as is the case in the trellis of which we have spoken. Moreover, the irregularity with which

Fig. 6.

the branches are distributed upon the stalk causes an unequal distribution of sap, and its determination to certain points, whether of superabundance or scarcity, resulting in the destruction of the shoots less favorably situated.

VERTICAL CORDON WITH ALTERNATE SHOOTS (Fig. 6).—M. Rose Charmeux has brought this new arrangement to perfection in the following manner. He plants the stocks at a distance of 28 inches one from the other; then he regularly distributes the shoots on each side of the stem, making them spring alternately every 10 inches in such a manner that they may be separated by an interval of 20 inches on the same side of the stem. We shall find, in discussing the method of pruning, how perfect regularity in this respect may be obtained.

The trellis thus arranged presents the following advantages. In scorched and dry soils, the stocks and the horizontal branches arranged in the manner previously described suffer much from the heat of the sun, from which they are very imperfectly shaded by their leaves. In the trellis with alternate shoots the main stalks are completely covered. These cordons may therefore be usefully employed in dry soils. Besides, these cordons are suitable for the most confined space, since they require only 28 inches.

But this vertical cordon cannot be conveniently applied against a high wall, for as the sap tends toward the top of the plant, the shoots toward its base become feeble and languishing. We have remarked this fact at Fontainebleau, where the wall which supports these cordons is 13 feet high. It is our opinion that the main stem should not be allowed to exceed 80 inches. If the wall is higher, the following modification (Fig. 7) may be used, equally due to M. Rose Charmeux. For a wall 13 feet high the stocks are planted only every 14 inches; then the stalk of each is allowed to rise alternately to 66.4 inches and to 13 feet; but the latter commence to bear shoots only directly above the point where the first cease—that is to say at 66.4. In this manner the wall is completely covered and the cultivator has not to dread the destruction of the lower shoots.

The trellis with vertical cordons which we have just described is simpler and more easily formed than those with horizontal cordons; but experience has shown that its produce is less abundant, since for an equal surface it offers a smaller number of branches.

M. Rose Charmeux, struck by the advantages offered by the simplicity of this arrangement, has attempted to render it as fruitful as the horizontal cordons. He completely resolved the problem in 1828 by means of the following modification, which gives for the same surface of wall a greater number of shoots, and consequently a greater number of clusters. As this new arrangement is at once more simple, and more easily obtained than the others, and as it may be accommodated to walls of all heights, we recommend it to the exclusion of other plans, and

Fig. 7.

we shall choose it to study in detail the method of cultivation and pruning suitable to trellised vines.

CULTIVATION OF TRELLISED VINES, ARRANGED WITH VERTICAL STEMS (CORDONS) BEARING OPPOSITE SHOOTS.

IN this new arrangement (Fig. 8) the vines are planted at the foot of the wall every 14 inches. The wall, whatever be its height, is horizontally divided into two equal parts. The first vine stops at half the height of the wall. The second is allowed to reach its summit, and thus continue in this manner alternately to the extremity of the wall. The reader will observe that the shorter vines bear shoots from about 12 inches above the soil to their tops, and the taller begin to bear shoots only on leaving the lower half of the wall. These pairs of shoots are 10 inches distant from each other. This arrangement offers all the advantages presented by the form shown in Fig. 7; that is to say, that in consequence of the length of the main stem furnished with shoots, these last are maintained in equal growth. Moreover, the new form grows more shoots for the same surface than is shown in Fig. 7, and more even than the horizontal cordons. If, however, the wall is only 39 inches high, all the vines may be made to rise regularly to its summit. But in that case they should be placed at intervals of 28 inches and should be furnished with branches from 12 inches above the soil to the top of the wall.

Let us now turn to the labor necessary to the establishment of such a trellis as the one described above.

WALLS PROPER FOR THE TRELLIS.—The vine arranged in vertical cordons accommodate themselves to walls of all heights. At Thomery the gardens are subdivided by bearing walls parallel to each other and separated by a space of from 40 to 46½ feet. They may, however, be placed nearer to each other, but in that case the earth between will be too much shaded, and cannot be turned to account. These bearing walls are only 85 inches high, and were built many years after those of inclosure; that is to say, when the young vines which it is intended they shall support, have been carried thence by many successive

Fig. 8.

layerings (*couchages*). Thus the interest of the capital employed in these constructions is economized. Some of the cultivators of Thomery have also constructed a sort of *counter espalier*—that is to say, a lesser wall opposite the principal bearing wall, in masonry 45 inches high and 6 to 8 inches thick. Only one of these little walls is placed 100 inches in front of the principal walls the most favorably situated. In this manner they derive every possible advantage from their best exposures.

This subdivision of the inclosures not only enables the cultivator to obtain a larger harvest, but it likewise offers the advantage of diminishing the currents of air, concentrating the heat by the radiation, and thus hastening the ripening of the grape.

It has sometimes been attempted to use for trellises the walls by which terraces are supported. The superfluous moisture of the soil draws to the bottom of the wall and injures the vine stalks. For almost every other kind of fruit-tree very projecting copings offer more inconveniences than advantages, but for the vine the case is different. On the one hand, these copings take place with those movable fruit-houses which we have recommended for covering espalier trees in order to preserve them from the chills of the spring; and on the other, they shelter the vine from the moisture of the rains and dews, which results in a more active vegetation and a more prolonged development, injurious to the ripening of the grape. Finally, these projections preserve the clusters from the first cold weather of the autumn, and thus delay the time of gathering and facilitate their preservation. All the walls of Thomery are finished by tile copings. Their projection is greater in proportion to the height of the walls, being 14 inches for walls of 156 inches, 12 inches for those of 117 inches, 10 inches for those of 100 inches, 8 inches for those of 80 inches, and $5\frac{1}{2}$ inches for the little walls of the *counter espalier*. In the last case they are inclined only from one side.

The walls thus built are white, being covered with lime. This color at Thomery has given the most satisfactory results.

When the method of construction allows, smooth finished walls (*palissage à la loque*), should be used; we may then dispense

with the trellis. But the great quantity of plaster required by this arrangement renders it too expensive to be used beyond a certain distance from Paris. We must have recourse to frames, and for the form of trellis of which we are speaking, they should be erected in the following manner:

A series of galvanized iron wires (No. 14) are extended along the wall. Upon these wires laths are fastened every 12 inches, and to these laths the main stem of each vine is trained alternately to half the height and to the summit of the wall.

EXPOSURE OF THE WALLS.—The trellised vine demands an exposure at once as dry and as warm as possible. In the north and the centre of France this double condition is best fulfilled by a southeast exposure. A southern exposure is doubtless the warmest, but the trellises with such an aspect also receive too directly the damp winds and rains of the southwest. The cultivators of Thomery use the side of their walls exposed to the west and to the southwest, but gather from thence grapes of the second or third quality only.

PROPAGATION OF THE VINE.—On the different modes of propagation to be chosen for a trellised vine, we would offer the following observations. Slips or cuttings propagated from layers are often used in forming trellises. When intended for a permanency, they are planted in the manner which we will proceed to describe. They begin to bear fruit only in the fourth year. They should be used only in the absence of the layers themselves, for whose first fruit we are not obliged so long to wait. The layers, or as they are called at Thomery, the *chevelées*, are generally to be preferred, for when they are transplanted with care, and their roots are not dried by exposure to the air, their vegetation during the first years is more vigorous, and thus time is gained. Two sorts of layers are used—uncovered layers and layers in baskets. The uncovered layers (Fig. 9) are freed from all the earth which surrounds them, when they are planted for a trellis. When planted with care, they will begin to bear at the end of three years. The basket layers (Fig. 10) are prepared in the following manner. In the spring is made an osier basket (b) of an

Fig 9.

oval form and 12 inches long by 10 inches broad, and having a depth of 10 inches. These baskets should be made of green osier, that they may remain intact during a year. When the proper time for making the layer has arrived, the shoots to be operated upon being before chosen, a hole is pierced in the bottom of the basket at the point A, by which the shoot enters; each basket is then placed at a depth of 6 inches in the soil, and they are then filled with earth of good quality, to which has been added a portion of vegetable mold. Lastly, the top of the shoot is then cut in such a manner that only two buds or germs are left above the soil, and the whole is sustained by a prop. The operation is terminated by taking off all the buds on that part of the stem situated between the mother branch and the basket. This suppression is necessary to prevent these buds from absorbing the sap in their development at the expense of the layer. During the summer the two buds on the layer

Fig. 10.

freely develop themselves, and put forth abundant roots, so that at the end of the year the layer is ready for use. The whole is then taken up and the layer hardly suffers at all from the separation from the parent stalk. This undoubtedly is the best method of propagation, and is that which is preferred at Thomery. Unhappily, on account of the expense attending the transportation of the basket layers, the cultivator is often compelled to use the unprotected layers, or *chevelées*.

GRAFT.—As to the graft, this mode of propagation, or multiplication, is employed for trellised vines only as an exception, and in circumstances analogous to those which render this operation necessary in ordinary vineyards. We have in the preceding part of this volume described the graft "*en fente*

bouture" as one of the best for the vine. If, however, a *chevelée* may be used, it is to be preferred to any other for the purpose. It is planted near the vine, and the operation is conducted in the same manner as for the graft.

The great advantage of the *chevelée* is that it bears fruit the following summer.

An essential precaution, and one which is equally applicable to the three methods of propagation above mentioned, is the proper choice of the shoot intended to furnish the graft, the cutting or the layer. The shoot should have borne fruit during the year, and should be strong and in a healthy condition. The clusters should have been such as to exhibit in the highest degree the distinguishing qualities of the variety which it is desired to cultivate. Before the grapes are gathered, the shoots which appear the best suited for this purpose should be marked.

PLANTATION AND PROCESS OF BEDDING OR LAYING THE TRELLISED VINE.—*First Year*.—The superabundant moisture with which the soil is always impregnated during the winter is especially injurious to the roots of the newly-planted vine; it causes them to decay. The end of the winter, when the earth is drained sufficiently, is the time which should almost always be chosen for planting. There is no exception to this rule, but for dry and scorched soil like that of central and southern France. In such ground it is better to plant at the beginning of winter. The following is the process employed for layers in baskets:

If the land to be used is new, or if it has not lately been thoroughly cultivated, it should be dug during the winter to a depth of 32 or even so deep as 39 inches, if the soil is pebbly. The soil thus spaded up should extend to within 53.2 inches of the base of the wall. In the preceding chapters we have already spoken of the necessity that the soil should be such as to conduce to the health of the plants which it is intended to support. Such a soil is particularly essential to the vine. It may even be advisable, after the first spading mentioned, to carry it to a depth of 48 inches, and to widen it to an extent of 89 inches. The permeability of the soil should also be

increased by the mixtures of earth already described, and the earth in all cases should be richly manured.

When the land is thus prepared, in the spring, a trench is opened 17 inches deep in dry, 20 inches deep in wet soils. The outer edge of this trench is 28 inches from the wall. The earth taken from it is deposited on each side. Vegetable mold, or compost, mixed with earth, is then spread over the bottom. In this trench the baskets containing the layers are placed. Should the soil be very dry the trench may be opened at 39 inches from the foot of the wall, instead of 28. A greater length of the stem is then bedded before it reaches the wall, and the roots, spread over a greater space, will more easily find the portion of moisture which they require. The space to be left between these layers is of course determined by that which it is intended shall be left between the vertical cordons upon the wall. If the cordons are intended to be 14 inches distant one from the other, the layers are separated by an interval of 28 inches, as after they have been laid, each layer should furnish two branches at the foot of the wall. A number of layers might be planted equal to the number of stems supporting the cordons, which are intended for the wall; but in that case they would be separated by a less interval, and would, as it were, starve each other. Moreover, the number of layers being greater, the expense would be increased.

It will, then, be more advisable to proceed in the manner just described; at all events, in those cases where the wall being only 39 inches in height, all the stems are to extend to the top.

When the stalks from the layers are separated at the base of the wall by an interval of 28 inches, the number of basket layers planted is equal to that of these stalks. If the first process is adopted, the layers are planted at the point A (Fig. 11), in the centre of the space by which the stalks against the wall are divided one from the other. In the second case, the layers are placed at the point A, in front of each of the points indicated by B.

The layers are planted in the following manner: From each

Fig. 11.

layer composed of two shoots, the least vigorous one is separated. The roots which issue from the basket are left untouched, provided that they are not broken, or dried by exposure to the air. This being done, at the bottom of the trench, and on that side which is farthest from the wall, a hole is made 6 inches deep and a little larger than the basket which it is intended to receive. In each of these holes a basket is placed in such a manner that the end of the shoot which it contains is turned toward the wall. That and the basket should be 10 inches below the level of the soil. A little notch is then made in the

upper edge of the basket on that side nearest the wall, so that the shoot may be easily turned in the required direction. Then on that side of the trench nearest the wall, and in front of each basket, is made a smaller trench, as is shown in the figure at *v*, 3 inches deep and 10 inches long. In this the shoot is carefully laid, and it is filled with earth mixed with vegetable mold up to the level of the soil. The first trench is partly filled with the earth which was taken from it, mixed with vegetable mold. This operation is performed in such a manner that the trench is left empty to the depth of 8 inches, that the layer is buried to the depth of 10 inches, and that the top of the basket is covered by a bed of earth 2 inches in thickness. The operation is concluded by cutting off the shoot, as it leaves the earth just above the bud *E*, or that which is nearest the ground. The sap being thus concentrated upon a single bud, it attains a more vigorous development, and that part of the shoot which is buried, puts forth more roots, which pierce the bark with greater ease, in proportion as the leaf-buds from which they spring are nearer to the light. The end of the shoot above the earth is fixed upon a stave or prop 39 inches in length, and the remainder of the earth taken out of the trench is piled up on each side in the form of a shelving bank. The result of this last arrangement is to retain a greater degree of moisture in the neighborhood of the newly-planted shoot during the summer.

When the cultivator has no layers in baskets at his disposal, and is obliged to content himself with uncovered layers or even with cuttings, they should be planted in the same manner as the basket layers, only care must be taken to place the earth firmly around the *chevelées* and especially around the cuttings, and all that part which is under ground should be surrounded with earth which has been considerably enriched.

We will now proceed to describe the attentions demanded by this plantation during the next summer. When the bud *E* is developed, it is fixed upon the prop. As soon as it has attained a length of 20 inches the top is cut off; next the premature twigs which are thus developed are removed when they are 4 inches in length. The result of this operation is to increase

the size of the stem by limiting the evolution of the anticipatory shoots, and to accumulate in a small space all the nutritive juices taken up by the roots. It also promotes the increase of the roots along the newly interred layer. No bunch of grapes is allowed to remain on this shoot for fear of weakening it. The whole plantation should also receive two or three dressings in the course of the year. They should be applied, if possible, after rather a smart shower of rain, and when the earth has slightly drained. If the soil is light and dryness is to be apprehended, the trench and the little ditch should be covered with a bed of manure 6 inches in thickness, besides that which has already been applied, and finally, the trench is filled with the earth banked up on each side. After this operation, the whole appears like Fig. 11.

SECOND YEAR OF THE PLANTATION.—Toward the end of February, the shoot developed during the preceding year is cut at A (Fig. 12), above the three buds nearest to the base, then it

Fig. 12.

is attached to a prop 53 inches long which replaces the first. When the shoots have attained a length of 6 inches the laterals are pinched out, so as to preserve only the shoots from the three buds just described. These shoots are fixed upon a prop in proportion as they grow longer. They are not allowed to exceed the prop by which they are supported, and the process of nipping off the buds is continued. Should

the shoots on the props be very vigorous, two clusters, at the most, should be left upon each, and should be treated in the manner which we will explain in the proper order. The same attentions are bestowed as in the preceding summer, and then a light dressing in November. The result then obtained is shown in Fig. 13.

Fig. 13.

THIRD YEAR.—Relaying.—In good weather in the first of March, or, if in the South, in the autumn, the layers must be examined in order to know if they have put forth shoots sufficiently large and vigorous to be relaid. If uncovered layers, and still more, if cuttings have been planted, the cultivator will be obliged to wait till the following year and even to the year after to repeat the process of bedding or laying. The roots on the previously bedded shoot will not be sufficiently numerous, they would injure in their development the new layer which it is intended to put down, and the future health of the stalk destined to be placed against the wall would suffer. In that case only the two finest shoots of the young stalk should be preserved. These are cut to a length of only 6 inches, and upon these only a single shoot is preserved during the summer. Should they not be strong enough for relaying in the following year, the same operation is repeated. The stalks obtained from layers in baskets may almost always be rebedded from the third year. In that case the following method is employed. A

trench 24 to 30 inches deep, according as the soil is more or less exposed to dampness, is opened at the foot of the wall, and is made wide enough to reach the young vines (Fig. 14). The

Fig. 14.

earth round the young vines is loosened with care until they turn naturally of themselves into the trench, in the bottom of which they are then placed in the manner shown by Figs. 14 and 15, that is to say, if each principal vine stalk is intended to produce two stalks to be trained on the wall (Fig. 15), the two

Fig. 15.

most vigorous shoots should be preserved, and they should be carried obliquely toward the wall, and from two stalks at the points B. If, on the contrary, it is intended that each principal stalk shall furnish but *one* stalk for the wall (Fig. 16), only

Fig. 16.

the finest shoot is preserved, which is buried in the trench and directed toward the wall at the point B, where it is intended to be trained. In both cases the shoots are covered as far as the foot of the wall by a bed of mixed soil and vegetable mold about 4 inches in thickness (Fig. 16). The trench is then filled with part of the earth which was taken from it, and the remainder is heaped up in a shelving bank at a distance of 40 inches from the wall, in order to preserve the moisture in the neighborhood of the newly laid vines, and thus facilitate a plentiful development of roots.

The upper extremities of the buried shoots are fixed at the base of the uprights of the trellis. These shoots are cut so as to preserve only the three buds nearest the base. This operation being concluded, the trellis presents the form shown in Fig. 14.

If the plantation of layers or cuttings has been in a trench at a distance of 40 inches from the wall instead of 28 inches, they must be brought to the foot of the wall only after a third laying, otherwise we should be obliged each time to cover too large a part of the shoot, which, as we shall see further on, will

prevent them from properly taking root, and so injure the strength of the vine.

If this method of planting for the trellised vine is compared with that used in the majority of gardens, it will be seen that it is very different. In fact, the vines are almost always planted directly at the foot of the wall, and the only part buried is that which was originally below the soil; so that the vine, the roots of which ramify with great difficulty, cannot, when thus, planted, develop new radical organs upon the stems below the soil. It puts forth roots with great difficulty, it is long in recovering from its transplantation, and its vegetation is never vigorous.

On the contrary, by adopting the mode of cultivation used at Thomery, which we have just described, the vine is placed under much better circumstances. The first year there is buried, besides the stem first covered with roots, 10 inches of the shoot, which during the two or three years preceding the relaying, covers itself with vigorous roots. Two or three years after this, 14 inches of the shoot are again laid, which in a little while is completely covered with roots. Each stalk intended for the wall is then provided with an underground stem 44 inches in length, bearing through all its length numerous and vigorous roots, which give to the vine more strength and hardiness than is possible when the method of which we spoke first is used. When uncovered *chevclées*, or those in baskets are used, the cultivator may be tempted to lay at once a length of shoot sufficient to bring the upper end directly to the foot of the wall, a length, for instance of 24 inches. This is a very bad plan, for the stems do not properly take root only upon the 12 to 14 inches nearest to the upper ends, because the woody and cortical fibres which run down from the buds to produce roots are not sufficiently numerous to put forth roots enough, and they pierce the bark at the same time that they meet the soil. It is desirable to lay only 14 inches at the most, if it is intended that the underground stalk shall be fully provided with roots throughout its whole extent.

METHOD OF PRUNING ADOPTED FOR THE VERTICALLY TRELL-

LISED VINE WITH OPPOSITE SHOOTS.—CONSTRUCTION OF THE FRAME.—*First Year*.—The shoots having been laid and brought to the foot of the wall, the buds are watched in their first development to see that they are not harmed by caterpillars, snails, or other destructive insects. When the three shoots have attained a length of about 6 inches, the *stipulary shoots*

Fig. 17.

(A, Fig. 17), which often grow by the side of the shoots properly so called, are taken away. Then, when they are about 12 inches long, we begin to break the tendrils which uselessly absorb the sap. This breaking of the tendrils is continued through the period during which the length of the shoot increases, and should be put in force while the tendrils are yet so soft that they may be easily broken. That is also the time which should be chosen to begin the formation of the stalk intended to be trained upon the wall. The following is the method then employed :

Let us suppose that one of these young stalks is represented by Fig. 17. From the three stalks which have been preserved, one is chosen having a leaf 12 inches above the ground. Let us suppose in our figure that this is the second shoot on leaving

the ground, and that the leaf aforesaid is situated opposite the second cluster. This cluster is taken off and the shoot is cut immediately above this leaf, as in B, Fig. 18. The top of the two

Fig. 18.

other shoots is then removed in order to hinder them from too great a growth to the detriment of the shoot upon which it is intended to operate. We may then proceed to train it upon the frame. The shoot under treatment is placed in a vertical position, and the two others are attached at an angle of forty-five degrees. A premature stipulary shoot will be seen immediately to spring from the axil of the leaf of the cut shoot (A, Fig. 18). This shoot should be broken when only an inch or two in length, so that the bud B at the base of this shoot is forced to develop itself. Before long this bud gives birth to a shoot

Fig. 19.

(A, Fig. 19), which is allowed to grow, and which is trained vertically. These young main stalks require no other care during the summer, so far as the frame is concerned, than the complete suppression of all the premature stipulary shoots

Fig. 20.

(A, Fig. 20), or of premature shoots commonly so called, as also of the tendrils. Upon each shoot should be left only the clusters c and d and the primitive leaves. These attentions should be given each year to all the shoots preserved.

Second Year.—The stems operated upon in the manner just described present the appearance of Fig. 21. They are then subjected to the second pruning. The two shoots (B) are completely taken off by cutting the first at A. Then the premature shoot c is cut at d immediately above the bud situated near the

Fig. 21.

base. During the following summer this bud develops itself as well as the germs immediately below it upon the secondary shoot,

Fig. 22.

indicated by the letters *EE*, which is called the *spur* (talon). The number of buds on the spur may be three or four. But two buds on the spur, one on each side and one at the top of the shoot, are preserved. The produce of the buds *EE* is entirely removed. This last operation is performed as soon as the shoots from the spur have attained a length of 4 inches. When the remaining shoots are fastened to the frame, the young vine presents the appearance of Fig. 19. When the centre shoot (*B*) puts forth, as it increases in length, a leaf above that point where the first pair of lateral shoots is attached, it is cut *above* this leaf at the point *A*, as in the preceding summer, in order to obtain from the axil of this leaf a new shoot for the formation of a second pair, which must be treated in the same manner. The two lateral shoots are subjected to the same operation.

Third Year.—In the following spring each stem on the walls

Fig. 23.

presents the appearance of Fig. 23. The shoot *A* is cut at the point *B*, in order to obtain the same result as in the preceding year. As to the branches *C*, they are cut near their base in order to form the two first *coursons* or double branches shown

Fig. 24.

in Fig. 24. The same development takes place during the summer below the point B, as well as the same operation upon the new terminal shoot. The product of the buds D is removed.

Fourth Year.—Fig. 24 shows the result of the operations performed during the preceding years. The same method of pruning is practised one year after another until the trellised vine has covered the space for which it was intended, when it presents the appearance shown in Fig. 7.

All that we have just said applies to those stems which rise to half the height of the wall. Those which extend to its top grow more rapidly during the first years. During the summer, after the layering by which they have been brought to the wall, two shoots are left upon each of the three first shoots. The

following year, at the winter pruning, the strongest of the three shoots resulting from thence is chosen; the two others are taken away and the remaining one is cut at 20 inches above the point where it is attached to the frame. In summer it is allowed to retain but three buds, which give place to three new shoots. The best of these is again chosen and extended also to 20 inches. The same process is repeated till the vertical stalk reaches the point where it is intended to support lateral branches. Then the same series of operations is employed as in the first case.

This method of forming the main stalks has this advantage, that each pair of lateral branches being separated by a regular interval of 10 inches and by a knotty place at the point of attachment of the successive extensions, the course of the sap is arrested below every one of these knots and thus obliged to act with the same intensity on all the lateral branches of the same stalk. Such is not the use in the vertical cordons which are more rapidly formed, as they are more extended at each pruning.

CARE NECESSARY TO THE LATERAL BRANCHES.—*First Year.*—The essential principles of pruning the lateral branches are the following: In the case of the vine, the clusters are attached to

Fig. 25.

shoots proceeding from the branches of the preceding summer (Fig. 25). The shoots accidentally developed on the old wood never bear grapes (Fig. 26).

The further the buds are removed from the base of the branch, the more fruitful are the shoots to which they give rise.

Fig. 26.

Hence it appears that the shoots should be left entire, or be left very long. But in that case we immediately encounter the following inconveniences. Thus, if the shoot in the Fig. 27 is cut in B, the buds *c* and B are the only ones which will be

Fig. 27.

Fig. 28.

developed, and we shall have in the following year the result shown in Fig. 28. If, then, we trim the shoot at the points A and B (Fig. 28), we shall have two new shoots produced at the top of the shoot B. Continuing to trim in this manner the lateral branch or immediate support of the young shoot increases in length each year from 4 to 6 inches, and thence results great confusion through the whole extent of the trained vine, and moreover, a progressive enfeeblement, or, as it were, starvation, of the new shoots, and, consequently, an immediate diminution of fruitfulness.

On the other hand, if the shoot in Fig. 27 is cut so as to

preserve only the bud A, this bud is so near the old wood that the shoot produced from it will bear no grapes.

It will be best, then, to cut this shoot (Fig. 27) as short as possible, to hinder the lateral shoot from increasing in length, but in such a manner, however, as to preserve a bud far enough from the old wood to produce grapes. Experience has shown that in order to attain this double end, the shoots from varieties of only a slight or average degree of strength should be cut above the two buds the nearest to the base, one of these two being that bud which, hardly visible, is on the base of the shoot itself—that is, just where it springs from the stalk (Fig. 27). Two new buds are developed, and in consequence, two new shoots. The branch will then present the appearance shown in Fig. 29.

Fig. 29.

The shoot A has borne clusters during the summer. The shoot B is too near the old wood to have produced anything. It is called *the shoot of replacement*—that is to say, it is that intended to undergo the next pruning. For that, almost all the old wood is cut from the top of the spur. Then the shoot B is cut above the two buds nearest its base. During the summer two new shoots are thus produced, and each year the same method of pruning is repeated, so as to allow the old wood to increase as little as possible in length, and keep the fruitful shoots as near as possible to the direct channel of the sap. Such is the method of pruning applied to the branches intended to bear grapes for the table.

There are, nevertheless, varieties so hardy that, should they be subjected to this process, no fruit, or very little, would be

obtained. The different varieties of muscats, the Frankenthal, and others which we have noted in our list, are of this description. For these, the shoots should be left a little longer. They are cut off below the third bud. This difference does not result in increasing the length of the lateral branches. In fact, such is the strength of these vines that three shoots are obtained from each lateral branch. That from the top, which generally bears the clusters, is the one preserved, then that at the base, intended to undergo the next year's pruning. The intermediate one is suppressed. The same operation is each year repeated.

DISBUDDING THE LATERAL BRANCHES OR COURSONS.—When the *coursons* are cut so as to preserve but two or three buds, it will often happen, nevertheless, that a larger number will be developed. Only two, at the most, should be left at each point. The shoot A (Fig. 30), nearest the old wood, is preserved as a shoot of replacement, together with that farthest from the same

Fig. 30.

point B. The latter generally bears the clusters. There are, however, two cases in which but a single shoot should be left on the *courson*. First, when none of the shoots of the *courson* bear clusters; then a single shoot, that from the base, is useful as a shoot of replacement. By the others being suppressed, the remaining one becomes stronger and will yield finer fruit in the following year.

Second. When the two shoots of the *courson* both bear clusters, which occasionally occurs in very fertile years. As it is advisable to leave only two small clusters or one large one to be supported by each *courson*, as we will presently explain, a retrenchment will be necessary. In this case, the shoot from the base only is preserved, and it will become at the same time a fruit-bearing shoot and a shoot of replacement. In consequence of this retrenchment the shoot in question will acquire more strength, it will bear better grapes, and the new shoot will afford the finest products of the following year.

The proper time for putting in practice these different trimmings, is, as soon as the young clusters make their appearance upon the shoots, that is to say, when they are about 10 inches long. We must repeat what we have said concerning the cutting of the shoots—that there should be left upon each one of the shoots preserved only the clusters and the primitive leaves. Then all the supplementary shoots and the tendrils should be removed as soon as they appear.

PINCHING THE SHOOTS.—The buds on the shoots of the vine, as on those of other trees, should often be pinched back. The end of this operation is to prevent the shoots from confused growth, to diminish the growth of some of the shoots to the profit of feebler ones, and finally to favor the development of the grapes by enabling them to profit by the sap, which would otherwise pass to the shoots which would spring from the buds destroyed.

In order to obtain these different results the buds on the shoots should be pinched off as they develop themselves to the length of from 16 to 20 inches, and their extremities only should then be cut.

MANNER OF FASTENING THE SHOOTS IN SUMMER.—The shoots of the vine are fastened in order to prevent their being broken by the wind, and in general this fastening should be twice practised upon the same shoot. The first fastening is made when the shoots have attained a length of about 12 inches. Then the shoots are but slightly compressed in the rush which serves as a ligature. Otherwise, in growing, they would break themselves.

Fifteen days after this first fastening, we proceed to the second, or *récollage*, as it is called by the cultivators of Thômerie. At this time the shoots are tied as close as is necessary to arrange them conveniently. This process of fastening should be successively made for the different shoots of the same vertical main stalk, and by beginning with the most vigorous we may equalize their strength. The shoots of the vertical cordons should be inclined at an angle of forty-five degrees.

RENEWAL OF THE COURSONS.—We have seen that in spite of the care which has been taken to keep down the spurs by an annual trimming, to the shoot nearest the base, they will always increase a little in length, and the shoot which they bear will diminish in vigor in proportion as they are removed from the point where the spur or lateral branch is attached to the cordon or vertical main stalk. In order to remedy this inconvenience, the shoots which sometimes grow at the base of the spurs are carefully preserved, whatever may be the age of

Fig. 31.

the spurs from which they spring. Then, of the two upper shoots, that which bore the worst cluster is suppressed. The following year the spur is cut at A, Fig. 31, and the shoot B is cut above the two lowest germs or eyes in order to form a new *courson* or spur.

REPLACEMENT OF THE SPURS (COURSONS).—Sometimes also certain spurs disappear entirely or are not developed where they are expected, and in either case spaces are left which it becomes necessary to fill. This accident may be remedied by the graft.

CARE OF THE GRAPES.—It is in particular the intelligent labor bestowed upon the grapes from their first appearance to their maturity to which the cultivators of Thomery are indebted for their success. The following are the processes adopted:

SUPPRESSION OF THE SUPERFLUOUS BUNCHES.—Too large a quantity of grapes upon the vine produces the same result as a superabundance of fruit upon other trees. A great quantity of grapes are gathered, but the clusters and the berries are small, and the vines are enfeebled for the following year. If the necessary retrenchments are made, the same result in weight is obtained, and the grapes are larger, better flavored, and command a higher price.

THINNING THE BUNCHES.—When the berries have attained the first stages of development, it will be proper to thin them.

Fig. 32.

With a straight, pointed pair of scissors we cut from each bunch—first, all the abortive berries; and secondly, those in the middle of the bunch, together with some of those which, although on the outside, are too much crowded. If the bunches are very long, as is often the case with young and vigorous vines, the point of the bunch (A, Fig. 32) must also be removed, since the berries which it bears would be slow in ripening. The result of this thinning is, that, other things being equal, the grapes are ripe fifteen days earlier, the berries are a third larger, and those intended to be kept through the winter will keep better.

The thinning practised at Thomery is performed by women, and is applied to at least half the harvest—that is to say, 500,000 kilogrammes of chasselas.

GATHERING THE LEAVES.—At the time when the thinning takes place should also be applied the first *épamprement*, or picking off the leaves. At first only the leaves turned toward the wall and those more or less broken or distorted are removed. When the berries begin to look transparent, a second *épamprement* takes place. A few leaves on the front of the vine are then removed in situations where the foliage is thick; but the leaves which shelter the branches, the *parasols*, are preserved with care. Finally, when the berries are entirely cleared, and begin to turn yellow, the leaves which shadow them are removed. If they are exposed earlier the berries will harden and cease to increase in size. The bunches thus uncovered are exposed alternately to the dew and the sun, by the action of which they acquire that beautiful pale yellowish brown which distinguishes the chasselas of Thomery.

Black grapes require particular care in this respect. The first removal of the leaves should not take place till the grapes are completely colored.

These successive strippings of the leaves from the vine result in progressively arresting the annual growth of the vine, a long time before it would otherwise cease. The fruit, therefore, sooner begins to mature, and will be completely ripe by the first cold weather.

PROTECTIONS.—The very projecting copings which we have recommended for trellised vines are insufficient, if the wall is more than 80 inches high, to protect the grapes from the dampness of the atmosphere. It will then be advisable to place a movable pent-house at about half the height of the wall after the last gathering of the leaves in the middle of September. This pent-house should project about 20 inches.

ANNULAR INCISION.—By ringing, girdling, or breaking; intended to hasten fifteen days the ripening of the grape, and which will increase also fully a third the size of the berry.

RENEWAL OF THE TRELLISED VINE.—The trellised vine, attended in the manner we have described, will bear fruit for more than fifty years. But there comes a time when the successive renewal of the spurs produces upon them so many knots that the circulation of the sap is interrupted. The vegetation becomes languishing, many of the *coursons* wither, and the vertical stems themselves finally perish. When this state of decrepitude first manifests itself, the cultivator proceeds to the renewal of the vine. All the vertical stalks are cut at about 8 inches above the soil (Fig. 33). This trimming concentrates the action of the sap upon this point, and so develops a certain number of shoots. During the summer the most vigorous are chosen and the others removed. The following year the reserved shoot is cut above the third bud, and the same care before described is applied to the three resulting shoots. Then the process is continued as for the establishment of a young vine. To assure its success, it is well to remove, from the time when the shoots are suppressed, as much earth as possible from the foot of the trellis without injuring the roots of the vine, and we should apply abundance of manure, which should be covered with a bed of new earth nearly equal in thickness to that removed. When the trellis to be renewed is in a state of advanced decrepitude, and when a certain number of vertical stalks are completely withered, and the regularity of the whole is lost, we proceed in a different manner. Each vertical stem is cut off, as we have said, above, and those which are dead

Fig. 33.

removed. During the summer the two most vigorous shoots on each vertical stalk are preserved, and they are allowed to grow to the top of the wall. The following year there is taken away from the foot of the trellis as much earth as possible, about 16 inches, taking care not to harm the old roots. The earth is hollowed out, completely as it were isolating the base of each vertical stalk. Then they are laid at the base of the trellis previously arranged for their reception. As each one leaves two

shoots, and as this number is more than sufficient to furnish the required number of vertical stalks, we preserve only the proper number, choosing the most vigorous for our purpose. These stalks and shoots are finally extended on the ground by means of wooden hooks, in such a manner that the new shoot directed toward the wall leaves the ground at exactly that point where the new vertical stalk should rise. A bed of manure, 3 inches in thickness, is then spread, and the rest of the hollow is filled with new earth. All these vertical stalks will develop with exceeding vigor during the year, and will then be managed like those of a new plantation. We saw thus renewed, in 1848, a trellis more than eighty years old, belonging to M. Rose Charmeux. The operation was attended with no difficulty, and its success was complete.

It will readily be perceived that by the aid of this renewing process the duration of the trellised vines is almost indefinite, and it will seldom be necessary to replant. The cultivators of Thomery have a proverb, "He who plants an *espalier* is not there to take it away." This mode of a renewal may be applied to an old trellis more or less regularly disposed in horizontal cordons, which it may be desirable to replace by vertical ones. The process in such a case is as follows:

In the spring each cordon is cut immediately above the spur (*courson*) nearest the base (Fig. 34). During the summer two

Fig. 34.

shoots are preserved upon each spur and allowed to grow freely. The following year the ground at the foot of the trellis is dug

out as we have explained. Then the foot of each vertical stem is deeply laid bare and laid down horizontally so that the extremities of the shoots are connected to the foot of the wall at each of those parts where it is intended they shall form new vertical stems. The rest of the process is conducted in the manner already described.

CULTURE OF TABLE GRAPES IN THE OPEN AIR (PLEIN VENT).

The table grape is also cultivated in the open air,* but the climate of Paris is the extreme limit of this culture. The vines are arranged upon *espalier* and then managed as before described. They are even sometimes trained upon poles or stumps, and the method pursued is then the same as for the ordinary vineyard.

At Thomery the interval which separates each inclosure is used in the following manner: *Espaliers* are established parallel to the walls. The first is at 80 inches' distance, and the others are separated by an interval of 8 ft. 6 in. These *espaliers* are sustained by a trellis similar to that on the wall. They are supported on wooden posts, or, as is better, on those of schistose stone, analogous to slate. These posts are placed at a distance of 5 ft. 4 in. one from the other. Sometimes for these posts are substituted iron uprights fixed in prisms of sandstone placed in the ground. In this case the wooden cross-pieces may be replaced by lines of iron wire which pass across the uprights. The main stems of the vine form upon this frame a series of little vertical cordons like those just described. These *espaliers* are, moreover, planted with the same care as the trellised vines, and are treated in the same manner.

The interval of 8 ft. 6 in. which separates each *espalier* is occupied by a row of vines on poles, propped up as in the

* "Open air" is here used not in contradistinction to vines protected by glass, but those simply protected by walls and copings as just described.

ordinary vineyard, and subjected to the same method of cultivation. These poles, separated by an interval of 53 inches, rise to a height of 13 inches above the soil, so that the rain may not cover the grapes with mud.

In the same climate, the same variety of grape supported on a pole is always inferior to that cultivated upon a wall. The grapes from the pole vines are always worse than those from the *contre espalier*.

The earliest varieties only should be cultivated in this manner, since the temperature of the *contre espaliers* is always lower than that of the *espaliers*.

CULTURE OF TABLE GRAPES IN SOUTHERN FRANCE.

In the south of France the greater warmth and dryness of the climate hastens to a great extent the annual vegetation of the vine, and the ripening of the fruit is accomplished without its being necessary to increase the warmth of the atmosphere artificially, or to moderate and even to arrest the growth of the vines. Hence the vine grows most vigorously and the choice varieties of table grapes which are native to these regions have a much greater development than those which belong to the centre and north of France. Finally, these varieties require less pruning in order to produce grapes. These different considerations give rise to the following modifications in processes of grape culture for those regions.

First. The vine should be placed on *espaliers*, single or double, the supports of which should be like those already described. In all cases the walls of the garden which have the warmest exposure should be devoted to the vine, and for these walls should be selected the latest varieties.

Second. The vines should be planted before winter, as if planted later they suffer much from the dryness of the spring.

Third. As the vine grows with much more strength in the south than in the north of France, whether on account of the climate, or the nature of the varieties peculiar to that region, it is necessary that they should be planted at a greater distance

one from the other. For the vertical cordons, with opposite lateral shoots, it will be proper to leave an interval of 24 inches between each cordon instead of 14.

Fourth. The *courses* of those varieties analogous to the chaselas, on account of their strength are cut so as to leave two buds as we have explained, but all those which grow with more strength are cut so as to leave *three* buds.

Fifth. The operation of thinning the clusters is as efficacious in the south as in the north, but removing the leaves would be much more injurious than beneficial. Only the leaves which cover the clusters are to be taken off, and those only at the time when the grapes are perfectly transparent.

Sixth. The vine in the south being stronger than in the north, a third more clusters than the amount previously specified are allowed to remain upon the vine.

DISEASES OF THE VINE—DESTRUCTIVE ANIMALS AND INSECTS.—The diseases of the vine have been already referred to, and we will confine ourselves at present to the consideration of the destructive animals and insects, which especially attack the trellised vine.

Birds, and particularly sparrows, thrushes, grossbeaks and black-birds are the great enemies of the trellised vine. When these birds do not fly in large flocks and descend in great numbers upon one place, they occasion little mischief, and the cultivators of Thomery adopt no precaution against them. Nets undoubtedly would be a good defence, but their price prevents their being employed over a large surface.

M. Orbelin, of St. Maur, near Paris, has contrived, as a defence against birds, little mirrors with a double face, of a very moderate price, and the result, up to the present time, has been very satisfactory. In the spring the first young shoots are often devoured by snails or slugs. Their size, their slow progress, and their habit of taking refuge in the chinks of the wall or behind the trellis, and of coming out in the morning or during the rain renders their destruction easy.

The *kermes*, known also under the name of gall insect, belongs to the genus *coccus*, and particularly attacks the peach

and the vine. When it has acquired complete development toward the end of May, it presents the following appearance :

The male (A, Fig. 35) appears in the form of a little multipede

Fig. 35.

or woodlouse covered with white dust. The female appears like a little brown shell, B, adhering very firmly to the branches of the trees. About this time the males impregnate the females and die. The females lay their eggs directly, and the eggs

remain surrounded with a little mass of white down, and covered with the dried body of the female, who expires as soon as they are deposited. These eggs hatch rapidly, and the insects issue from the shell which covers them, toward the end of June, to the number of more than a thousand. Hardly visible to the naked eye, they spread themselves over the surface of the leaves and young shoots, and destroy them by piercing their epidermis and absorbing their fluids.

Toward the month of November, when the leaves fall, the kermes abandon them and fix themselves on the branches, choosing in preference, where the trees are *en espalier*, the side next the wall, where they remain torpid through the winter, appearing like little brown stains. In the month of April they change their skins, rapidly increase in size, and give birth to a new generation.

The measure-worm is the larva of a moth, which in the spring greatly injures the vine by devouring the young shoots as they are put forth. It is difficult to find it, as it has the form and color of a little dried stick. It carries on its ravages during the night, and it is then that the cultivators of Thomery, armed with lanterns, seek it out and destroy it.

GATHERING AND PRESERVATION—FRESH GRAPES.—The grapes should be gathered only when perfectly ripe. The longer the

Fig. 36.

vintage is delayed in the centre and north of France, the highest is the flavor of the grape. The first frosts of autumn, to which it is very sensitive, should however be anticipated. The gathering should take place in a dry time. Each cluster should be taken by the stem, and detached by means of the pruning shears.

As the grapes are gathered they are deposited in little baskets lined with vine leaves and fern. These baskets are arranged on what is called a crotchet, or sort of hod, shown in Fig. 36, which can be carried by one man to the storehouse, or to the place where the grapes are packed for market.

The following is the manner employed each year in the preservation of a great quantity of grapes by the cultivators of Thomery :

First, a certain portion is retained on the trellis to the latest possible moment. They choose the clusters from the two upper cordons of the walls having a southern exposure. These grapes are the least watery, and consequently the least susceptible to cold. They guard them by sheltering them with leaves of fern, and even with straw matting, and thus preserve them until Christmas. The grapes which they wish to preserve still later they treat in the following manner: Those which they wish to retain till May are chosen from the poles, or the counter espaliers. The bunches are taken which have been subjected to the thinning process and which are formed of the largest and least crowded berries. They are cut a little before they are completely ripe—that is to say, from the 25th of September to the 15th of October. The grapes intended to be kept only till March, may be taken from the espaliers, and are gathered from the 1st to the 15th of November.

The place where the grapes are kept is generally some room or building connected with the house, and especially devoted to this use. Shelves about 30 inches wide, placed one over the other, cover the walls from floor to ceiling. In the middle of the room, and 30 inches distant from the lateral shelves, another series of shelves rises to the ceiling. These shelves are composed of a frame of wood filled up with a grating of iron

wire. It is upon this grating, which is covered by a slight layer of very dry straw, that the grapes are spread. They should often be inspected, and the berries which begin to decay should be removed by the scissors.

A storehouse on this plan presents the following inconveniences. Heat must often be introduced in order to defend it from the winter's cold, and the result is an injurious change of temperature. On the other side, the accumulation of moisture makes it necessary that it should be aired from time to time, and produces the same result in an inverse mode. Finally, if the currents of air produced by this ventilation are too great, the grape dries, shrivels, and loses, if not its quality, at least its commercial value. We think, then, that it is better to use the storehouse a description of which the reader will find at page 685 of the second part of this work. It will be necessary but to change the arrangement of the shelves, and also to use chloride of calcium with precaution, for fear of shrivelling the grapes.*

When it is necessary to preserve only a small quantity of grapes, the same storehouse will serve at once for grapes and

* The reference here is to the "Cours Élémentaire d'Abriculture," from which the present account of the Thomery system is translated. M. Du Breuil there gives a very full and accurate description of a room or house for preserving fruit of all kinds; the principal features of which are the provision of means whereby the fruit is kept at an equable temperature, free from all pressure produced by the fruits pressing upon each other, and free from dampness. The latter point is attained by keeping a vessel of *chloride of calcium* in the house—a substance which must not be confounded with *chloride of lime*, which would quickly destroy the fruit. This caution is not unnecessary, as it is only a few years since a writer in the "Horticulturist" recommended chloride of lime for the purpose; having, no doubt, used this term under the impression that it was *simpler* than the word calcium. Chloride of calcium may be purchased cheaply, or it may be made by dissolving chalk or lime in hydrochloric acid. It must be evaporated to dryness, and calcined at a red heat; after it has become moist by exposure to the air in the fruit room, it loses its power of absorbing moisture, and must be again dried and calcined, but after undergoing this process it is as good as new. Most cellars in American dwellings maintain a very equable temperature during winter, and it has occurred to us, that a small wooden press, made air tight, shelved and kept dry by means of chloride of calcium, would form no bad substitute for Du Breuil's "Fruiterie." We hope to try it next season.

other fruits. The grapes should then be spread on shelves by themselves, or can be arranged in the following manner, which has the advantage of economy of space. Each bunch should be suspended by the point on a little hook of iron wire in the

Fig. 37.

form of an S (Fig. 37). Thus attached, they will be less liable to decay, because the berries will have a tendency to fall apart

Fig. 38.

from each other. The bunches are then suspended by the upper hook of the S, around hoops hung one over the other (Fig. 38), and themselves suspended from the ceiling of the room, and moved up and down by little pulleys. If we should wish to preserve a larger quantity of grapes, we may, for the sake of economizing space, substitute for the hoops wooden frames in

Fig. 39.

the form of sashes, as shown in Fig. 39. These sashes are furnished with rods, separated from each other by an interval of 4 inches, and having on one side little points intended to receive the hooks by which the clusters are suspended. These sashes are hung from the ceiling in such a manner as to fill the entire space, and like the hoops, move up and down. However, the grapes thus preserved wither and lose more of their quality than those preserved upon shelves.

DRIED GRAPES—RAISINS.—The large proportion of saccharine principle which the grapes of the south generally contain, renders it easy to dry and preserve them. They have thus become the object of special attention and considerable commerce for some countries in the south of Europe where are cultivated the varieties best adapted to this purpose. We have noted the most desirable of these varieties in our list. Malaga, Calabria, Egypt,

and Roquevaire in Provence are the principal places devoted to this culture. Zante in particular is distinguished for the Corinth grape, or currant.

The process most commonly employed for the preparation of raisins is the following :

When the fruit approaches maturity, the stem of the bunch is twisted, and the leaves are removed in part from the branch in order to expose the grapes to the influence of the sun's rays, in order to favor the action of the essential principles and diminish the superfluous moisture. The grapes are gathered at the proper time, and the spoiled berries are carefully removed.

After which the clusters are left upon hurdles exposed to the sun for one day. The next day a boiling ley is prepared from the ashes of the burnt vine cuttings, to which are added some handfuls of lavender, rosemary or other aromatic herbs. A bunch is plunged three times in succession into this ley. If the berries are slightly cracked, the ley is strong enough, but if they are much cracked, it is too strong. When it is properly prepared it is allowed to cool and settle ; it is then strained through a linen cloth and a second time placed over the fire. When it boils, each bunch is dipped into it three times in succession. They are then spread on the hurdles, which are exposed to the sun during the day and taken into the house at night. The raisins are commonly completely dried at the end of two or three days.

The Zante grapes undergo a different treatment. They are cut some days after they have attained their complete maturity. They are deposited on hurdles very close together, or on cloths placed in the full sun. When the berries preserving the pedicle begin to be detached from the main stalk, they are lightly beaten with little sticks, in order to hasten this result. They are then passed through a sieve in order to separate them from the stems, and lastly subjected to the action of a fan or winnowing machine, in order to remove the dust and rubbish.

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