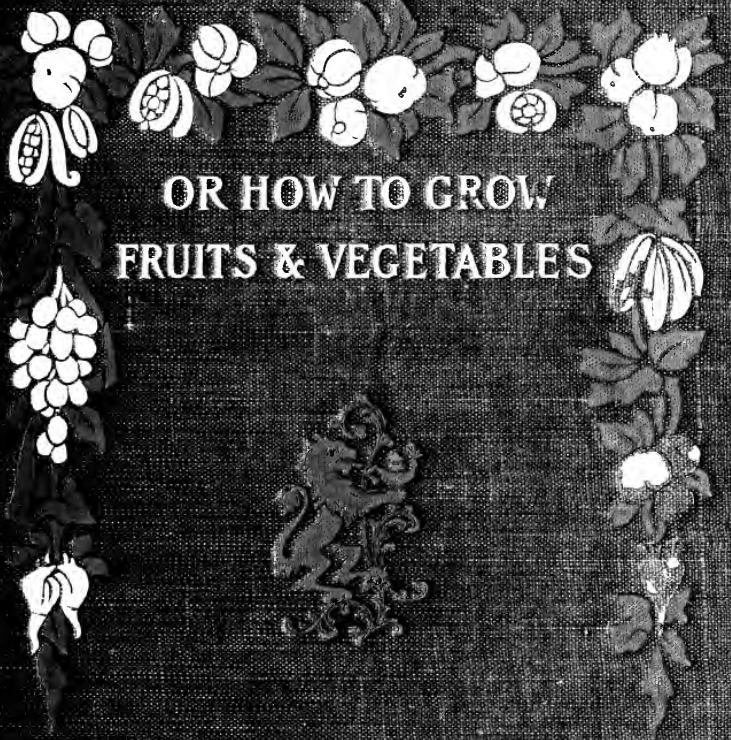
GARDENING FOR THE SOUTH



OR HOW TO GROW FRUITS & VEGETABLES

BY WM. N. WHITE

Revised by P. H. MELL, Ph.D.

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Wm. A. White

Gardening for the South;

OR,

HOW TO GROW VEGETABLES AND FRUITS.

BY THE LATE

WILLIAM N. WHITE,

OF ATHENS, GA.

THIRD EDITION, REVISED AND ENLARGED.

...BY...

P. H. MELL, Ph. D.,

Professor of Botany and Geology, Alabama Polytechnic Institute, Director of Alabama Agricultural Experiment Station.

WITH MANY ILLUSTRATIONS.

RICHMOND, VIRGINIA:
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CONTENTS.

GARDENING FOR THE SOUTH.

What Science Has Done for Gardening.

No one profession can stand alone without the support and help of other allied callings. The man who says that he can successfully conduct a market garden, or a farm, without the assistance of scientific thought and investigation is not well informed as to how much he is really dependent on what science has done, and is doing, for his profession. If he says that he has no patience with "book farming," and attempts to conduct his business with methods and implements in use fifty years ago, and declines to read and keep up with the progress of the times, he will soon find to his sorrow that his neighbors who do read and profit by what intelligent investigation is bringing to light, are far outstripping him in the improvement of their gardens and in the profits they are reaping by placing on the markets early vegetables and fruits.

This is the age of the printing press and thousands of thoughtful, earnest investigators are sending out by its means vast stores of valuable, practical information to him who will read and profit thereby. Practical men and women must read and learn what the rest of the world is doing if they expect to keep up with the progress of events. The competition in all departments of tilling the soil is now so great, that the most successful gardener or farmer is that man who not only accumulates books, but also is a diligent reader and a student in his profession, always looking out for new and improved ideas to enable him to produce the best and largest crop possible on his land with the least amount

of money and expenditure of labor. This chapter is not written for such wide-awake people, but it is prepared with the hope that the few who still condemn "book learning" may be convinced by argument and a presentation of an overwhelming array of facts that they are under great obligations to the results of the work and thought of scientific investigators.

It is due entirely to science that the insect enemies of vegetables and fruits have been so carefully catalogued and described, and remedies discovered for destroying them and holding them in check. Millions of dollars have been saved to the gardener and the farmer in this one item of contribution from science. The investigations made on the subject of plant disease and the remedies used to keep the plant in a healthy condition are the work alone of scientific brain and energy. The eradication of many of these troubles has made it possible for the gardener to cultivate certain vegetables and fruits which was next to impossible prior to the assistance rendered by the scientific investigator. What a boon to the cultivator of the soil is spraying! Yet scientific experimentation developed the spraying machine and the composition of the ingredients which make up the spraying mixtures.

The introduction of many of the best fruits and vegetables is largely due to the effort and forethought of our scientific men. The delightful Japan plums, the Japan persimmons, the many varieties of the citrus fruits, and the great improvement of the grape are well known illustrations of this fact.

Chemistry, among many other aids it has rendered to the gardener and the farmer, must be given full credit for placing the science of fertilization in the front rank of important factors. How crude and unsatisfactory were the methods of supplying plant food to the soil until the

commercial fertilizers were given to the agricultural world, and the fraud in the manufacture was eliminated by the analytical skill of the chemist. A few years ago the terms phosphoric acid and potash were known and understood by a few, but now they are common words in the vocabulary of the most ordinary gardener and the most obscure farmer. And yet this is the work of the chemist, and to him only must the gardener render thanks for the great benefits accruing to the land and plant in the use of fertilizers.

The improvement of the soil by cultivating leguminous plants in order to accumulate nitrogen from the atmosphere is a well-known fact, but the discovery of the germ principle, by which the plants have the power to extract this nitrogen from the air, was made in the laboratory of a German scientific investigator. Because of this discovery it is now possible to successfully cultivate peas, beans, clovers and other similar plants in localities where before the discovery of this germ principle it was next to impossible to secure satisfactory results.

Science has even stepped in to instruct on the subject of the cultivation of the soil, and much that is now known on this question is due to the investigations conducted at the State Experiment Stations under the direction of men with scientific training on such subjects as: (1) Why shallow plowing should be resorted to in the cultivation of certain plants which develop a large system of surface roots; (2) under what conditions deep plowing should be done, and (3) why the land should not be plowed while in a wet condition; (4) the value of rest to the land, and (5) the rotation of crops.

Most that is known in reference to irrigation and the value it is to those sections of the country where long, dry seasons are common must be credited to scientific research. Irrigation has made it possible to reclaim land

which was formerly a barren waste and make it produce in abundance many of the plants beneficial to man.

To the list of benefits conferred on the gardener by the scientific student must be added the power to reproduce our finest fruits by grafting and budding, making it possible to perpetuate the tree that has been improved to the point of maturing excellent fruit some time before fruit will ripen on the ordinary tree under the usual conditions. The great strides made in the selection of vegetable seeds, so that the purest seed and the most healthy plants may be secured, must be credited to the United States Department of Agriculture through the painstaking efforts of its scientific workers. The development of new and improved varieties of plants by crossing and by hybridization could only be possible through the intelligent experiments of a mind fully cognizant of the scientific laws governing the growth and the development of flowers and seeds. In this connection may be mentioned as a matter of illustration the splendid work accomplished by T. V. Munson, of Texas, and others in increasing the number of fine new grapes and extending the list of this delightful fruit. Within very recent times the United States Department of Agriculture has succeeded in producing by hybridization hardy orange plants, so that it is now possible to develop this fruit as far north as Southern Georgia with safety, and the indications seem to point to the chance of growing this plant as far north as Augusta, Georgia, without fear of destruction during our ordinary winters. Some of these hybrids are now growing in the horticultural grounds of the Alabama Experiment Station at Auburn, and the experiment will be made during the coming winter to continue the growth without any more protection than is usually given to peach trees, with the hope that the experiment will be successful.

In the matter of frost warnings to the market gardeners it will be interesting to know how much money is saved annually in the timely warnings from the Weather Bureau at Washington of the approach of cold waves, so that the delicate plants might be protected; and yet this is the work from its inception of scientific thought and under the management of scientific observers.

Again, in the improvement of the implements used to-day in the garden and on the farm, how much of the energy of the tiller is economized with such satisfactory results in the character of the work accomplished, and who will say that these improved machines and tools are not the outcome of careful training in scientific methods, with a knowledge of the principles controlling physical and mechanical laws? In the evolution of the modern plow from its primitive ancestor the wooden beam; the improved Planet, Jr., cultivator, with its many convenient tools when compared with the old-style hoe and rake; these, with many other improved tools that might be mentioned, should convince any one of the great assistance science is rendering the tiller of the soil in simply this one branch.

The United States Department of Agriculture has spent millions of money in the past years for the benefit of the gardener and the farmer. It is certainly true that no one is prepared to say that this wealth has been thrown away, and that the agriculturist has not been vastly benefited by its expenditure in his behalf. The work of this great department has been almost entirely in the hands of scientific men of well-known ability; and thousands of pages of practical information and contributions to knowledge have come from their efforts, attesting the great value of their investigations to the "man with the hoe."

The State Experiment Stations have been in existence only twelve years, and yet in that short time the researches made by the scientific staff have introduced new methods of planting and cultivating which the gardeners have found superior to those in practice before the establishment of these stations. The hundreds of bulletins treating of every subject relating to plant growth and animal economy are in growing demand, and they are being read by thousands of people interested in the farm and the garden who uttered anything else but a kind word in behalf of the stations when Congress made the appropriation for their maintenance in 1887.

The foregoing argument in defence of the position that science has rendered incalculable service to the gardener is sufficient justification for the reappearance of this book, and the hope is entertained that the work will receive a hearty welcome among those for whom it was written.

Preface to the First Edition.

I have thought that, upon a subject so accordant with my tastes as is horticulture, I might prepare a work adapted to our climate and useful to the public. The repeated inquiries made of me, as a bookseller, for a practical treatise on the subject, and these inquiries growing more frequent with the manifest growth of the gardening spirit among us, led to the undertaking. Yet, written as it has been, in the intervals of trade and subjected to its constant interruptions—now advancing but a line at once, again a page, or an article—suspended totally for nearly two years, then hastily finished, looked over, and printed under circumstances that rendered the author's revision of the proof impossible—many defects of style, and errors of the press, are manifest. These, if the work contain the information sought, practical men will readily excuse in a first edition.

To claim much originality in a modern work on gardening would display in its author great ignorance or great presumption. If it did not contain much that is found in other horticultural works, it would be very defective. Gardening is as old as Adam, and what we know to-day of its principles and operations has been accumulated, little by little—the result of thousands of experiments and centuries of observation and practice. Hence, from the gardening literature of our language, have been selected, for this work, those modes of culture which considerable experience and observation have proved adapted to our climate. The species and varieties of plants found here most desirable for use or ornament have been selected and described. This mass of material has been

modified and increased by pretty copious garden-notes of my own. Still, it has been my object to make a useful and reliable, rather than an original work. Where an author's language suited my purpose, it was at once incorporated into the text. If the expression is sometimes changed, it is generally to make it more concise. * * *

The necessity of a Southern work on gardening is felt by every horticulturist in our midst. Our seasons differ from those of the Northern States in heat and dryness, as much as the latter do from those of England. Treatises perfectly adapted to their climate we are obliged to follow very cautiously. English works require the exercise of a still greater degree of judgment in the reader, the climate of England being still more cool and humid. Again, our mild winters admit of garden work nearly every day of the year. All the heavy operations of trenching, manuring, laying out, pruning, and planting trees, shrubs, and hardy ornamental plants, are at that season most conveniently performed. In this particular aspect our climate is much like that of the south of England. Hence, while the calendars of operations, in works prepared for the Northern States, seldom agree with our practice, those in English works are often found to coincide with it. But even where the time of performing certain operations is the same in both countries, the long, dry summers, and still milder winters of this climate, often render necessary a peculiar mode of performing the same.

We need, then, works upon gardening specially adapted to our latitude and wants. But with the exception of the valuable matter scattered through our agricultural and horticultural periodicals, Holmes' "Southern Farmer and Market Gardener," written some years since, and briefly treating of the kitchen garden department merely, is the only work containing anything reliable on the subject.

The chief original features, then, of this work are, that it endeavors to give more or less information upon the whole subject of gardening; and information, too, that is practically adapted to our climate, habits, and requirements. In the fruit garden department, especially, a good deal of new matter is to be found. Throughout the entire work processes are frequently described, and methods of culture given, which are suited only to climates and seasons like our own. Those varieties of plants and trees are pointed out which experience has proved are best adapted to our orchards and gardens. * * * *

Unusual prominence is also given to the general subject of manures, as they are the foundation not only of successful gardening, but of profitable husbandry. Besides the various works consulted, the experience of horticultural friends has been freely communicated. Valuable hints have been derived from Rev. Mr. Johnson and Mr. Thurmond, of Atlanta; Professor J. P. Waddel, Dr. M. A. Ward, and Dr. James Camak, of Athens; Right Rev. Bishop Elliott, of Savannah; Dr. J. C. Jenkyns and Mr. Affleck, of Mississippi; and especially from J. Van Buren, of Clarksville, Georgia, whose successful efforts to make known and diffuse native Southern varieties of the apple rendered him a public benefactor. It is hoped we shall yet see a work on fruit trees from his pen.

If this treatise, with all its imperfections, shall in any degree increase the love of gardening among us; if it shall cause orchards to flourish, shade trees to embower, and flowers to spring up around any Southern home, the author's purpose is accomplished.

WM. N. WHITE.

Athens, Ga., 1856.

Preface to the Second Edition.

The revised edition of "Gardening for the South" was mainly prepared by our lamented friend, W. N. White, the author of the first edition, whose sudden death left the work in an incomplete state. At his special request, made while on his death-bed, we have undertaken to finish the work begun by him, to the best of our ability, and while we do so, we ask the indulgence of the reader to pass over and forgive any imperfections he may detect, for we feel conscious of our inability to present to the public as perfect and interesting a work as would have been done had the author been permitted to have finished it.

The necessity for a new and revised edition must be apparent to every reader, as the former edition was published in 1856; since which time the discoveries, improvements, and progress in Agriculture and Horticulture have been very great.

Ten years' additional experience in Agriculture and Horticulture by the talented author of the first edition is our warrant for recommending the present work to the favor of the public, as few men were more ardently devoted to the culture of the soil than he was.

Should opinions and facts be found stated in the present work at variance with those in the former edition it will be attributed to the experience alluded to above, for with him it was always a pleasure to acknowledge an error when it was found to be such. Many and valuable additions have been made to all the departments, and more particularly to the lists of varieties, both of vege-

tables and fruits, together with the improved methods of cultivation, as the object of the author was to present to the public a practical work adapted to the soil and climate of the Southern States.

J. VAN BUREN,
DR. JAS. CAMAK.

Athens, Ga., 1868.

Preface to the Third Edition.

It has been thirty years since the last edition of this important work was issued, and such great changes have taken place in all departments of horticulture within this period that a new edition of the book has been long demanded.

Many varieties of vegetables and fruits now popular in the South were unknown twenty years ago, and some that were cultivated in those days have been supplanted by other varieties of superior quality. The character and composition of fertilizers have also undergone great changes, and remarkable advancement has been made by the introduction of the numerous brands of commercial manures. Certain methods of cultivation also differing from those in practice some years ago have become popular, and are now in general use throughout the country.

A great impetus has been given to gardening in the South by the many excellent bulletins which have been issued from the Experiment Stations of the several States on the subjects of botany and horticulture, so that the science of cultivating the fruits and vegetables has become almost a new profession. The man who is now guided by a book written twenty or thirty years ago will be far behind the times in nearly all departments of planting and cultivating.

For these reasons there has been a demand for many years on the part of the people of the South for a revision of White's Gardening.

In rewriting the book liberal use has been made of the

bulletins of the Agricultural Experiment Stations, the publications of the United States Department of Agriculture, botanical, horticultural and agricultural magazines and papers and standard works on gardening. Some of the illustrations have been culled, with the consent of the authors, from the publications of P. J. Berckmans, L. H. Bailey, G. F. Atkinson, F. V. Coville, H. N. Starnes, R. L. Watts, Peter Henderson, Samuel H. Rumph, Johnson & Stokes, George L. Taber, and Vaughan Seed Company. To Professor F. S. Earle, biologist and horticulturist of the Alabama Experiment Station, special acknowledgment is made for suggestive and valuable criticisms.

P. H. MELL.

Auburn Alabama, January, 1901.

GARDENING FOR THE SOUTH.

CHAPTER I.

FORMATION AND MANAGEMENT OF GARDENS IN GENERAL.

SITUATION.—The situation of the flower garden and lawn should be immediately adjacent to the dwelling, in order to yield the highest degree of pleasure. The most satisfactory arrangement is to form the lawn directly in front, and the flower garden on the side, sufficiently near to be overlooked by the drawing-room windows, while the sides of the dwelling, in part, and its entire rear, including the kitchen and servants' yard, are sheltered and concealed by trees. A dwelling thus embowered in well-grown trees is always regarded with pleasure. As neither the fruit or kitchen garden, especially the latter, can be considered ornamental, they should not, though near the dwelling, be placed obtrusively in view. Near they should be, for if either is distant, time is lost in watching its progress; it is in danger of being neglected; and even if this is not the case, its choicest products may gratify the palate of any one besides its owner. A good arrangement is to place them in immediate connection with the pleasure-ground, proceeding from the shrubbery to the fruit department, and thence to the kitchen garden. The latter should also have an independent approach. It should be near the stables, in order that it may be copiously replenished with manure without too much labor.

Much, however, depends upon the soil. The best at

command, in the vicinity of the dwelling, should be chosen. Proximity to water is also highly important, especially if it can be readily employed for irrigation. Low situations are more liable to late and early frosts, but their abundant moisture renders them desirable for summer crops. A diversity of soils and exposures in the same inclosure is desirable.

Care should be taken that the productiveness of the kitchen garden be not diminished by the proximity of large trees, which are injurious by their drip to all plants beneath them, and by their shade and extended roots to those more remote. The small, fibrous roots of trees extend far beyond their branches, and one is not safe from these devourers much short of the length of the stem which they nourish. If trees exist too valuable to be removed, dig a deep trench near them, and cut off all roots that extend into it. This will probably relieve the adjacent crops from their injurious effects.

Aspect and Inclination.—A light exposure to the south is generally to be recommended. Gardeners take pride in having early crops, and this compensates in some measure for their shorter duration in such an exposure. A northeastern aspect is to be avoided, as our worst storms are from that direction. A northwestern exposure, though cold and late, is less liable to injury from late and early frosts, as vegetation in such situations is sheltered somewhat from the rising sun, and does not suffer so much if it becomes slightly frozen. It is not the frost that injures plants so much as the direct heat of the sun falling upon the frozen leaves and blossoms. Hence an easterly aspect is generally objectionable for tender plants.

Cabbage, cauliflower, strawberries, spinach, lettuce, and other salads are much more easily brought to perfection in a northern aspect. Many of these run up to seed

immediately if exposed to the full sun. Of fruit trees the apple succeeds well on a northern slope. The soil, too, is usually richer, and will retain its fertility longer, other things being equal, in such an exposure. It is a great advantage, if the garden slope at all, to have it slope in more than one direction, thus giving a choice of exposure, and generally also of soil, as it is thereby adapted to both late and early crops. But when the drainage is good, a level is to be preferred, as by the aid of the fences any desired exposure can be obtained for particular plants. Indeed, in southern climates nothing after quality is more to be regarded than the inclination of the soil.

Whatever be the situation or aspect, a garden must be as level as possible. Any considerable inclination in a southern latitude subjects the richest portion of the soil to the danger of being washed away by its violent storms. In the rich, mellow soil of a garden cultivated as it should be, if there be much perceptible slope, a single storm will often cause a loss of manure and labor that will require considerable expense to repair. If the ground is not level at first, it is necessary to resort to hillside ditching or to throw it at once into terraces of convenient breadth. To do this the eye cannot be trusted; a levelling instrument is required. The steeps of these can be clothed with Kentucky or Texas blue grass, or strawberry plants, to prevent them from washing.

Each terrace must be so raised just at its edge, that it will retain all the water which falls upon it, permitting none to flow over even in the heaviest storms. Any excess of water should be carried off by proper underdrains, if needed, and not suffered to run off the surface. Surface ditches are a poor substitute. Terracing is not very expensive. The horizontal line is first determined with a level and staked off. A few turns of the plow are made on the hillside just below the stakes, and the earth

thrown up with a shovel to the staked line. If more earth is required, the plowing and shovelling must be repeated until a sufficient bank is formed to retain the water. During the first year, occasional breaks in the bank may happen from violent storms, but if well repaired, after the banks become settled, they will rarely be broken over by the accumulation of water, particularly if proper underdrains or surface ditches are provided.

SIZE.—A garden should be proportioned to the size of the family, and their partiality for its different products. A small garden with a suitable rotation of crops, and well manured and cultivated, will yield more pleasure and profit than an ordinary one of three times its size. An active, industrious hand can take care of an acre, provided with necessary hot-beds, cold-frames, etc., keeping it in perfect neatness and condition; or if the plow and cultivator be brought into requisition, as they should be in large gardens, four times that amount can be under his care, provided there is not much under glass.

If but little room can be allowed near the house, cabbages, carrots, turnips, potatoes, and the common crops, can be grown in the field, if *well enriched*, and be cultivated mainly with the plow. The fruit garden should be in a separate department, as the shade of the trees is very injurious, and the exhaustion of the soil by their roots still more so. Moreover, the heavy manuring required for the vegetables will not do so well for fruit culture. The trees will also be in the way of the cultivators used in working the vegetables. Dwarf pears upon the quince stock are the least hurtful, and may be admitted into the vegetable department along the walks.

FORM.—The form will often depend upon the situation of the garden or the inclination of the ground. When a matter of choice, a square or parallelogram is most convenient for laying out the walks and beds. A parallelo-

gram extending from east to west gives a long south wall for shading plants in summer, and a long, sheltered bor-

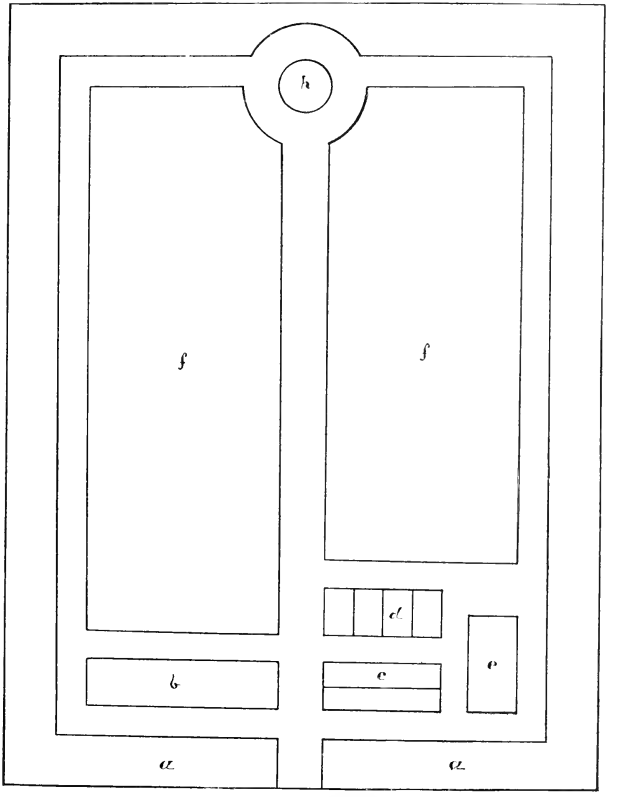

Fig. 1—Garden Plan.

der for forwarding early crops. An oblong shape has the further advantage of giving longer rows for the plow or cultivator.

LAYING OUT.—A convenient plan is given in Figure 1. The borders *aa* should be amply wide, in large gardens as much as twelve feet. The space *b* is laid out for the asparagus bed; *c* the cold-frames; *d* the hot-beds (in those sections of the South where needed); *e* the tool-house; *h* may be used for grapes, an arbor or a fountain as desired. The remainder of the space is taken up with walks and the plots *ff*. The walks next the boundaries should not be less than four and a half feet in width. The long central walk should be at least five or six feet wide, so as to admit a cart. In this case the main walk should proceed, as in the figure, from the entrance to near the farther border, where a portion should be taken off of the adjacent plots to form a circular turning place for the cart and other vehicles brought into the garden. Plows are used so much in the cultivation of the garden that it is best to make the plots *ff* without the usual cross walks. In this case the borders should be made of sufficient width to give room enough for all those vegetables which will not permit cultivation with the plow. Where only the spade and hoe are used, in quite small gardens, the plots *ff* may be subdivided into smaller ones by walks three to four and a half feet wide, extending from the borders to the main walk; and a portion of these plots should be laid out each year in beds four feet wide for onions, beets, carrots, etc. The earth should be dug out of the main walks four inches deep and spread evenly on each side over the adjacent ground. These walks may be covered with gravel, so that they will be kept dry and attractive; or fresh tan-bark, if the garden is located convenient to a tanning establishment, may be used instead of the gravel. The bark will keep out the weeds for two years, when it should be used as a dressing for the strawberry beds, and its place filled with a fresh sup-

ply. No more alleys and walks should be made than are required for convenience in the gardening operations.

Figure 2 is another design for a vegetable garden with the fruit orchard and ornamental grounds attached. This plan was adapted for this book by the permission of the editor of "American Garden."

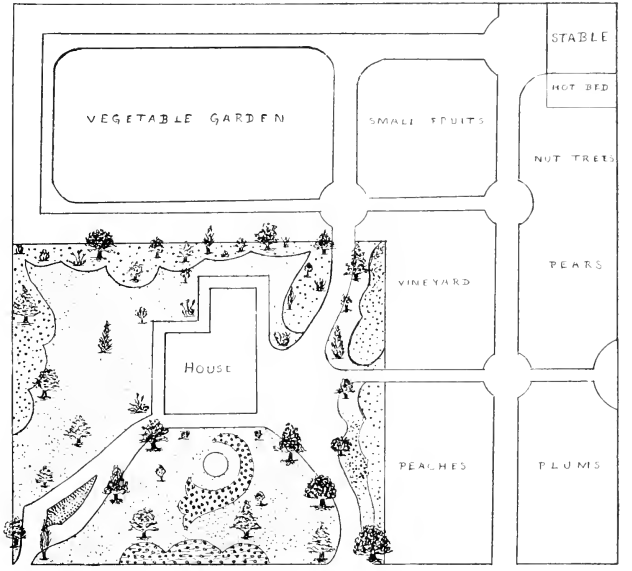

Fig. 2—General Plan of Grounds. Adapted from "American Garden," July, 1894.

Box is the best edging wherever it succeeds, which it does admirably throughout most of the South. All main walks should be wide enough for two persons to walk abreast, for which not less than four and a half feet are required.

Planting vegetables for market requires a slight

alteration in the plan proposed for the home supply. In this case, of course, the planting should be on a large scale, and the vegetables should be arranged in long rows or drills, so as to permit of cultivation with the horse and plow. There is not much attention paid to laying out walks and dividing the land up into systematic and permanent plots, as in the case of the home garden, but vegetables of the same kind are planted together in the most convenient form for easy cultivation and harvesting. In all other respects, however, the rules governing one apply with equal force to the other method of gardening. In harvesting and preparing the vegetables for market the reader is referred to the chapter devoted to that subject.

FENCING.—The objects of fencing are to procure shelter for delicate plants from cold winds, also shade for those that require it, and, above all, to keep out of the garden intruders of all kinds, that the owner may enjoy its fruits without molestation. A high, close board fence, or a stone or brick wall, tolerably answers the purpose; but the only thing to be relied on is a living hedge. The Osage Orange, the Pyracanth, the Cherokee and single White Macartney roses thrive in the South, and are all good for this purpose. Osage Orange plants may be raised from seed, or bought at the nurseries. The Pyracanth, or Evergreen Thorn (*Cratœgus pyracantha*), will make a hedge as effectual as the Osage Orange, and, as it is an evergreen, is much the more desirable. The blossoms in spring are very showy, and it is covered in winter with bright scarlet berries, and hence it is often called the Burning-bush. It grows freely from cuttings in sandy soil, but these cuttings should remain in the nursery-bed a year, to become well rooted before use. *Citrus trifoliata*, or Japan Hardy Lemon, is considered by P. J. Berckmans as the coming hedge plant for defensive as well as ornamental

purposes. It requires but little trimming after the third year. It makes an attractive appearance in spring by its numerous white flowers. *Ligustrum amurense*, or Privet, is another hedge plant that is well known for satisfactory results. Mr. Nelson gives the following directions for planting and trimming a hedge, which apply equally well to Osage Orange and Pyracanth:

"PLANTING.—First dig a trench where the hedge is intended to be grown, two spades deep, throwing the surface to one, and the subsoil to the other side; then throw the surface soil down on the bottom of the trench, and if it is very poor, add a little manure, or good surface earth. Autumn is by far the best time for transplanting, and it can safely be done as soon as the leaves are dropped. Cut down the plants to within four inches above the roots before planting. Several authors recommend planting in double rows, but I decidedly prefer a single one. Assort the plants in two parcels, those of large and those of small size, and lay the smaller ones aside for the richest ground. Stretch the line firmly, and place the plants in as straight a line as possible, one foot apart; fill up the trench with earth, leaving about two inches above ground; press the earth not too firmly, but water plentifully, and after that, level the whole nicely.

"TRIMMING.—It is perfectly useless to plant a hedge and leave it to be killed by weeds, or grow without trimming. A young hedge will require the same amount of labor as a row of Indian corn. The plants having been cut down so much, will, of course, start vigorously the ensuing spring. A good hedge ought never to be trimmed in any other than in a conical shape, as in Figure 3. When trimmed in a conical shape, *every shoot will enjoy the full*

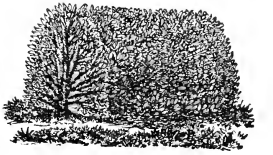

Fig. 3—Section of Hedge.

benefit of air, light, and moisture, and by this simple and natural method, a hedge can be shorn into *a strong wall of verdure, so green and close from bottom to top, that even a sparrow cannot, without difficulty, pass through it.* In order to make a hedge so thick and impervious as above mentioned, it is necessary to go to work even in the first summer, with a pair of hedge shears, pruning the young growth, when about three months old, at the same time laying down some of the most vigorous shoots to fill up any vacant places found near the ground. These shoots may be fastened to the ground with hooked pegs. They may be considered as layers, will soon send up a number of sprouts, making the hedge impenetrable for pigs, and nearly for rabbits. The young twigs may be trimmed in a wedge shape, not more than one foot high, and at the base six inches broad. The next season the hedge may be allowed to grow one foot higher, and three or four inches wider at the base. This pruning is most readily given with a reaping hook (a sharp sickle without teeth), making the cut with an upward stroke. Thus the management must be continued until the hedge has attained the intended height, allowing an addition of four inches broader at the bottom for every foot more in height. A hedge, regularly trimmed twice a year—in June and November—with the exception of the first years, when it requires a little more care than afterward, will continue impenetrable for fifty or even one hundred years."

If cuttings of the Cherokee Rose (*Rosa laevigata*) are planted by the side of a plank or wire fence, two feet apart, they will grow up and cover it in a short time, and effectually repel man and beast; but the growth is so rampant that it requires constant shortening in. It is also apt to die out at the bottom and become unsightly, and is in all respects much inferior to the single white Macartney (*Rosa bracteata*), an evergreen, and very easily

grown from cuttings. The latter is very thorny, and of beautiful foliage. It never dies out at the bottom, whether pruned or not, and south of Virginia, is very hardy, and of luxuriant growth. A satisfactory fence can be made with this, by setting good chestnut or cedar posts, eight feet apart, planted about two and a half feet in the ground. Bank up the soil to form some twenty inches high along the line of the fence, then form the usual paling fence, or nail a good wide bottom board, and finish the fence with heart-pine six-inch planks, or with stout wire, strained through holes in the posts. The wire fence may be four feet high. The roses should be rooted cuttings, and may be planted at first, even eight feet apart, and by layering and training the bottom shoots, if the ground is kept in good order, in three years they will repel every intruder. It is better, where plants are abundant, to set them out four feet apart. This hedge requires less pruning than any other to keep it impenetrable. After the posts and slats have decayed, the bank itself, grown over with roses, will repel all intrusion. The roses should be set at about the original level of the ground, and not at the top of the bank. My own hedge of Macartney rose, when three years old, trained on a common fence of rails and paling, formed a barrier perfectly secure, and very ornamental. I see but one objection to it. It is in summer always in blossom, and therefore attracts all the bees in the neighborhood. In my fruit garden I have thought that the injury done to peaches and grapes by wasps and bees has been much greater since the hedge has grown up than before. It is a fine bee plant. In a more northern climate the sweetbrier might answer as a tolerable substitute.

The American Holly makes an efficient and beautiful hedge, but is slow of growth and very hard to transplant. It can, however, be safely planted by selecting a mild,

cloudy day the last of February, or early in March, *cutting off the top* as directed above by Mr. Nelson for the Osage Orange, and exposing the roots meanwhile to the air as little as possible. Thousands of yards can be thus planted with little loss.

For an ornamental hedge about a cemetery lot or elsewhere, the Irish Yew and the Tree Box are decidedly the best plants that can be used. The narrow-leaved variety of Tree Box grows naturally, just the right shape, and needs very little trimming after two or three years. The Yew likes shade.

The Japan Quince planted by the side of a common picket or plank fence will, in a few years, make a good inclosure for a fruit or vegetable garden, and in flower is very ornamental.

After hedges are established, a trench should be cut on the garden side, two and a half or three feet from their base, sufficiently deep to keep their roots from extending into the beds and injuring the crops.

CHAPTER II.

SOILS—THEIR CHARACTERISTICS.

SOILS.—In all climates the character of the soil is of as much importance as situation or aspect. Soils are of two classes. They may be composed of matter derived directly from the decay of rock, like clay, loam, sand, lime, and other earthy and alkaline matters. Such a soil is classed as inorganic. Soils may likewise originate from the action and decay of plants and animals (organized beings), as, for example, peat, mould, and shell marl. Such a soil is classed as organic. A good soil is the result of the proper union of both these classes.

The mechanical texture of a soil is likewise especially to be regarded, as on this depends the proper retention of manure and moisture. There are two grand divisions of soils, the *heavy and light*, which pass into each other by imperceptible gradations.

The best classification of soils is that of Schubler, a German, and is founded entirely upon the relative proportions of the chief constituents of all soils—viz., clay, sand, lime, and humus. He classes them as follows:

Argillaceous Soils.—These contain over fifty per cent. of clay, and are readily known by their tenacity and greasiness to the feel, caused by the predominance of the clay in them. They are difficult to work, and in dry weather bake like brick and are not permeable to light dews and rains. In drying, they crack, exposing, in summer, the large roots of plants to the air and sun, and breaking the smaller ones. After heavy rains they become so saturated that they are for a long time unfit to work, and the plants therein die from excess of moisture.

In short, they are very cold when they are wet, and very hard when they are dry. The crops are full ten days later in coming to maturity than in a good, sandy loam. Ordinary clays contain about twenty-five per cent. of sand. If less than fifteen per cent. they are only fit for brick-making and pottery.

Clays are rich in alkalies, and have the property of retaining potash, phosphoric and silicic acids, and all salts necessary to the growth of plants; also of condensing ammonia and other gaseous matters. Hence they retain the virtues of manure better than most other soils. Where there is present lime and organic matters in sufficient quantity, clays, not too stiff, are excellent for wheat.

A *sandy soil* is in texture the opposite of the preceding and the lightest of all soils. It contains not over ten per cent. of clay. Such soils are harsh to the feel, lack cohesion, permit the water that falls upon them to pass instantly through them, and, as they heat up quickly, the crops raised in them soon suffer from drought. In them vegetation is early, but less vigorous and sustained. They do not readily combine with manures, the soluble parts of which are leached into the subsoil, or are washed out by the rains; so that, if manure be not constantly applied, they will yield but a moderate crop. Gravels are, in this respect, from the coarseness of their particles, still worse than sands, and are very properly called "hungry soils." Indeed, the fertility of a soil depends in a very great degree upon the fineness of its particles. Sand is sparingly soluble in water containing alkaline matter in solution, and in this state forms a portion, and sometimes an important portion, of the food of plants. It is soluble silica; in other words, dissolved sand, which the plant of wheat or maize has extracted from the soil and deposited upon the exterior of its stem, that gives the stalk or straw

its stiffness, and the lack of which in sufficient quantity subjects it to the attacks of rust. Silica usually forms a small proportion, too, of grains, legumes, and succulent roots.

For garden purposes, the only kind of sand suitable is that which is fine and has been rounded by moving water. The angular particles of road sand form hard, impermeable masses, and should never be employed. (*Lindley.*)

A *loamy sand* is a better soil than the preceding, and contains from ten to twenty per cent. of clay. These light soils are best adapted to tap-roots and bulbs and for striking cuttings, while those heavier are better fitted for plants with fibrous roots.

A *sandy loam* contains between twenty and thirty per cent. of clay, while all soils containing from thirty to fifty per cent. of clay are classed as ordinary *loams*.

In a garden designed for the cultivation of a variety of plants, both a light and a moderately heavy soil are desirable. But the best soil for general purposes is a loam of medium texture, rather light than otherwise, arising from a suitable admixture of the two, as they reciprocally correct the defects of each other. Where the other essentials are present naturally or added by man, such a soil is suitable for the production of nearly all garden crops. Any soil, by judicious culture, draining, and ameliorators, or amendments, can be converted into such a loam.

Lime in greater or less proportions is generally present in soils, commonly as a carbonate. It is sparingly soluble in water, and is especially, when combined with acids, as in the sulphate (gypsum), or the phosphate of lime (bone earth), an important portion of the food of our most useful plants. There are some plants, however, as the Kalmia, to which its presence, to any appreciable extent in soils, is injurious. Any one of the foregoing soils that contains from five to twenty-five per cent. of lime is

classed as *marly* (as a marly clay, a marly loam, etc.). When it contains over twenty per cent. it is classed as *calcareous*. A small percentage only of lime is required for the successful growth of plants. Marly soils, other things being equal, are the best adapted to fruit trees and wheat. They are also classed as argillaceous, loamy, sandy-loamy, and loamy-sandy marls, etc., according to the relative amounts in them of clay and sand; while if they contain above five per cent. of humus (vegetable matter in a state of decay), they are classed as humus marls, which may be also argillaceous, if containing fifty per cent. of clay; loamy, if from thirty to fifty per cent., and sandy, if less than thirty per cent. of clay.

Calcareous soils (which contain more than twenty per cent. of carbonate of lime) also are classed in the same manner with marly soils, according to the relative amounts of clay, sand, and humus they contain—as argillaceous, or loamy calcareous, etc.

Organic Soils.—Shell marls, though of organic origin, are naturally classed with the calcareous soils. The other organic soils are mainly of vegetable origin, resulting from the decay of plants, and are named humus soils. This last class is of three orders: 1st. Soluble mild humus, that is, vegetable mould in a fit condition for the nourishment of the plants which grow in it, such as thoroughly rotted peat, black or leaf-mould. 2. Acid humus, which contains a free acid, injurious, if not destructive, to most plants. 3d. Peat or other fibrous vegetable matter, which, though free from acidity, is not yet in a proper condition to impart nourishment to plants. Humus soils may be argillaceous, loamy and sandy, and also contain, or be destitute of, calcareous matter.

Humus has the property of producing a constant supply of carbonic acid by slow combination with oxygen. It aids greatly in keeping a soil in an open state, so as to

allow water and air to pass freely through it, and by virtue of its porosity it condenses and retains gaseous matter within, and it absorbs saline substances. Though such a soil freely parts with a superabundance of water, yet in dry weather it imbibes from the atmosphere large supplies of moisture. Schubler found that 100 pounds of dry humus would hold 190 pounds of water without losing a drop. In dry weather 1,000 grains of it spread upon a surface of fifty inches absorbed from the atmosphere in three days 120 grains of moisture. Of silicious sand the same amount absorbed nothing; sandy clay, 28 grains; loamy clay, 35; stiff clay, 35; garden mould, 52. Hence the best defence we have against drought is an abundant supply of decayed organic matter in a loamy soil. Neither clay, sand, humus, nor lime will, if pure, sustain a healthy vegetation; but properly mixed, they constitute the main ingredients of the richest soils in the world. As good loam contains sufficient lime, it is constantly employed with peat and sand, in varying proportions, by gardeners as the essentials for proper development of the plants they wish to grow therein.

Where true peat cannot be obtained, leaf-mould from the woods, black muck from the swamps, well decomposed and sweetened by exposure, or thoroughly rotted turf mixed with powdered charcoal, are the best substitutes.*

The *depth of a soil* is quite as important as its texture. If not naturally deep, it must be made so by trenching. Deep soils retain a constant supply of moisture in dry weather, so that the plants do not suffer; they do not become too wet in rainy seasons, as the earth drinks in and retains the rain below the surface; hence they are not so liable to wash away. If equally rich, they furnish

* Rural Cyclopedia, Dr. Lindley.

plants with a more abundant supply of food than shallow soils. Especially for all tap-rooted plants, a deep soil is indispensable. In the preparation of your garden, then, see that the ground is dry, deep, and rich. Good vegetables will not grow in a wet soil; a shallow soil will not furnish them with a regular supply of moisture; and the crops growing upon a poor soil never repay the labor bestowed upon them.

CHAPTER III.

THE IMPROVEMENT OF THE SOIL.

A soil may be improved in texture, in depth, and by the addition of such constituents necessary for the growth of plants as may be wanting.

The *texture* of a *clayey soil* can be rendered more pervious by *thorough draining*, deep trenching, and by the application of sand, ashes, lime and unfermented manure. Any clayey, retentive subsoil will be greatly benefited by good underdrains. A wet soil is always cold, as water has a much greater capacity for heat than has earth. The same quantity of heat that will warm the earth four degrees will warm water but one. Water, also, is a bad conductor of heat *downwards*. Boiling water can be gently poured over cold water without heating the latter, except a very little at the surface. Now, if the soil in spring be saturated with water colder than the summer rains, unless it be removed by drainage, the rains cannot descend to carry warmth into the ground; neither will the wet soil conduct the atmospheric heat downwards with much rapidity. But draw off the cold water by proper drains, and the warmer water can percolate through and raise the temperature of the soil. As the warmer water settles, the porous space it occupies will admit warm air. (*Thompson.*) Drainage, also, by admitting the atmosphere, renders the soil much more friable. Soils well drained have likewise been found to suffer far less from summer droughts than before. Underdrains should be not less than three feet below the surface, and four feet is much to be preferred.

Trenching renders the upper stratum of soil more light

and friable acting as drainage, but imperfectly. Its great utility is in increasing the quantity of soil to which the roots of plants find access.

DRAINAGE.—Lands which produce poor crops in spite of their fertility may be greatly improved by drainage, particularly if the soil contains a surplus amount of water The surface water must flow off freely and rapidly after sinking below the surface. Whenever it stands on the surface any considerable length of time after a rain it is evidence of the saturated condition of the soil, and therefore great need of thorough drainage.

The benefits of draining lands are summed up as follows: Deepening the soil, pulverization is accelerated, surface washing is reduced to a minimum, the soil works lighter, air is readily supplied to the roots of the plants, the evil effects of droughts are greatly reduced, because the open, porous condition of the soil permits of the absorption of air, and, when the air particles come in contact with the cool earth, moisture is precipitated from the atmosphere.

The usual shape of tiles is shown in Figure 4. It is an earthenware tube varying in diameter from three inches upwards. A collar fits over the joints and serves the double purpose of holding the sections together and at the same time preventing the entrance of sand at the joints. In clay soils no collar is required.

Fig. 4—Drain Tile.

The size of the pipe needed to drain the land must be determined by the amount of water to be conducted off, and the character of the adjacent lots from which the water may be drawn when the system begins operation; and it must meet the emergency of heavy flows of water. The pipes must be sunk deep enough to place them out

of reach of the subsoil plow and frost, and at the same time to render them efficient in the work they are to perform. Experience has proven that three to four feet below the surface will yield the best results. The fall must be sufficient to readily and rapidly carry off the water entering the system. Ordinarily, three inches fall to each one hundred feet distance will give a flow strong enough to meet the demands of the soil, but a greater fall will yield better results. In determining the size of the drain pipes the following fact must be borne in mind: The smaller the pipe the more concentrated the flow and the greater the chance for sweeping along solid matters, and thus ridding the pipe of clogging materials. The capacity of a pipe is proportionate to the square of the diameter, so that a tile one inch in diameter will have a capacity of one inch of water, while a pipe two inches in diameter will take four inches; one three inches in diameter will take nine inches. As a general rule, a three-inch pipe will drain two and one-half acres when placed five hundred feet apart, a four-inch pipe four acres, six-inch pipe nine acres, when the grades are less than three feet to the hundred.

The distance between the trenches to hold the tiles may vary from fifteen to fifty feet, depending upon whether the land is stiff clay or sandy. The mains must be large enough to readily take the water which the laterals collect and transmit to them.

The water goes in at the joints and not through the pores of the tiles, as some people assert, so that in laying the system care must be taken simply to place the pipes end to end without cementing or obstructing the joints, and thus preventing the free and ready flow of water into the system.

The old notion of covering the land with an elaborate system of piping has been abandoned, and it has been

found by experiment only necessary to tile the lower portions of the land, and the uplands will also be sufficiently drained.

Ashes and *lime* each have the property of rendering heavy soils lighter, and light soils more tenacious, and both more productive, especially for potatoes, turnips, beets, and peas, which delight in calcareous soils. In cold climates, plowing clay lands deeply in the fall, and exposing them to the action of the winter's frost, is very beneficial, but in sections where there is little frost and abundant and heavy washing rains, it is worse than useless. Turning under coarse vegetable or carbonaceous matter, as straw, leaves, pine straw, corn-stalks, a crop of cow-peas, clover, or any other green crop, bog, or leaf-mould, decomposed peat, and even tan-bark itself, so deeply beneath the surface as not to interfere with cultivation, will by the slow decomposition of these materials much increase the fertility of a clay soil by improving its texture. It is most improved by drainage, if needed.

The frequent working of the soil with the hoe and spade, thereby admitting the ammonia and fertilizing gases of the atmosphere, is itself very beneficial to clay soils, if done when the earth is dry. A clay soil is exceedingly injured if worked while wet. It is so difficult to work, and so liable to bake into a hard crust after every rain, that it will well repay, where materials for the purpose are at all convenient, to lay out a good deal of time and labor in improving its mechanical texture.

The *texture* of a *sandy soil* is much more easily improved than a clay, as the percentage of clay required to convert any sand into a loam is not very large, and can easily be added. Fortunately, too, in sandy soils, clay is generally near at hand, often lying but a few inches beneath the surface. A few loads of stiff clay, scattered thinly over the surface in autumn, are worth more applied to

such a soil than any manure, for the clay will render manures permanent in their effect, which else would leach through without benefit to the crops. The effect of the clay itself is lasting. Lime, as before observed, stiffens the texture of a sandy soil, and gypsum has the same effect. Ashes, leached or unleached, are also an excellent and profitable dressing to such a soil, but the best of all applications is a good clay marl. Peat, vegetable manure, and carbonaceous matters of all kinds, such as refuse charcoal, are good applications to these sandy soils, as they enable them better to retain the fertilizing properties of the manure applied, though they do not much affect the texture of the soil. Sandy soils very often rest upon a clay bottom, so that the thorough trenching which a garden should receive will often greatly improve its texture. Working such a soil while wet, and the continual use of the roller will also render it more tenacious. But clay is the great improver, and it is astonishing how small a quantity of fine clay will cement a loose sand into a good loam.

To conclude, in regard to the texture of soils, choose or make for the garden a loam of medium texture a little inclined to sand, and the finer its particles the better. Clays and sands both become objectionable as they depart from this friable, loamy texture, and the first step in their improvement is to bring them to this condition. A medium consistency best agrees with vegetation.

The *depth of soil* in the garden is as likely to need improvement as its texture. A deep soil is necessary that the roots may penetrate it freely in search of food, and be able to endure our summer droughts. The roots of a strawberry have been traced five feet down in a deep, rich soil. The difference in the freshness and growth of plants raised upon trenched soils and those growing upon soils prepared in the common manner is remarkable. In

lawns, the color of the grass will indicate very exactly the greater or less depth of the soil. The depth of soils may be increased by subsoil plowing, or trenching.

TRENCHING is the old mode of improving the depth of the soil in smaller gardens, and is usually performed in this manner: At one end of the plot to be trenched dig with the spade a trench three feet wide and two feet deep; throw the earth out on the side away from the plot to be trenched. Shovel the bottom clean, and make the sides perpendicular, leaving a clear open trench across the plot. Open another trench the same width, and put the surface spadeful of that into the bottom of the former trench, and the next spadeful upon that, until open to the same depth as the *first* one, adding meanwhile the necessary manures and amendments. When the plot is entirely trenched in this way, the last trench will remain open, which must be filled with the earth thrown out from the first one, which finishes the work. This method is now seldom resorted to, since the same ends are secured by the use of the subsoil plow with very much less expenditure of labor and time.

SUBSOIL PLOWING.—A common turning plow goes first, and plows as deep a furrow as practicable. It is followed by the subsoil plow in the same furrow, which should loosen the soil, without turning it up, to the depth of eighteen or twenty inches, unless it is a stiff clay or gravel. If the soil requires the application of organic matter, it is best to apply it before the deep plowing is done; or the organic matter may be secured by first preparing the land well and sowing in cowpeas or fieldpeas and turning under. This is one of the best ways of enriching the land, and should be always adopted where the land is poor.

CHAPTER IV.

FERTILIZERS AND MANURES.

It is the part of wisdom to return to the soil all those ingredients which the plants have taken off, so that the land will not become impoverished. Fertilizing, therefore, is the essential part of the gardener's duty each year.

The substances applied to the soil for its betterment may be divided into two groups:

1. Those minerals which amend the condition of the land by changing its texture, correcting its acidity and otherwise modifying its condition than by the nourishment they directly afford the plants. Such are clay, sand, lime, marl, old plaster, etc., when applied to soils which need them.

2. Organic and inorganic substances which supply the food for plants—such as barnyard manures and commercial fertilizers.

The first group may be applied at irregular, and probably at long intervals, in order to place the soil in the best physical condition for the well-being of the plant; but the second group of substances must be placed in the land in small or large quantities as the needs demand, each year in order to keep the fertility of the soil up to its maximum condition by restoring what has been extracted during each harvest.

The ingredients most likely extracted by the growing plant, in sufficient quantities to seriously affect the fertility of the land, are phosphoric acid, potash and nitrogen. The other substances entering into the composition of the plant are taken in such small amounts that the effects on the soil are inappreciable even after many years

of cultivation. It is important, then, that the three chemicals—phosphoric acid, potash and nitrogen—should be returned to the land each year in quantities sufficient for and in condition suitable to the immediate demands of the growing plant.

The nutritive manures mentioned in the second group are contributors directly to the demands of the plant, but barnyard manure is probably the most efficient fertilizer for restoring the soil to a normal condition than is to be secured from any of the so-called commercial fertilizers. It not only contains the elements required for plant food, but it also has the property of rendering available the stored-up ingredients and greatly improving the condition of the soil for absorbing moisture. Barnyard manure, however, is variable in its value, depending upon the character of food fed to the animals, the condition of animals—whether young and growing or old and feeble, fattening or in normal condition, the proportion of litter placed in the stalls, and the care with which the manure is kept. If fermentation has taken place, and the manure has been permitted to weather, so that leaching may result, of course the soluble constituents will be lost, and the fertilizer will be greatly depreciated in value.

"When practicable, it is best to apply manure in the fresh condition. The disposition to be made of the manure of the farm (both fermented and unfermented) must be determined largely by the nature of the crop and soil. Where improvement of the mechanical condition of the soil is the principal object sought, fresh manure is best adapted for this purpose to heavy soils, and well-rotted manure to light soils. Where prompt action of the fertilizing constituents is desired, the best results will probably be obtained by applying fresh manure to the light soil, although excessive applications in this case should be avoided on account of the danger

of 'burning out' of the soil in dry seasons. Fresh manure has a forcing effect, and is better suited to grasses and forage plants than to plants grown for seeds, such as cereals. Direct applications to root crops, such as sugar beets, potatoes, or tobacco, often prove injurious. The manure should be spread when carried to the field, and not left in lumps to leach."*

Commercial fertilizers are sold under two classes—viz., "complete" and "partial," depending upon whether the three necessary ingredients (phosphoric acid, potash and nitrogen) are present or only one or two of them. In determining which of these two classes of fertilizers to use the gardener must be governed entirely by the character of the plant and the condition of the soil.

"Plants," says Liebig, "contain combustible and incombustible ingredients. The latter, which compose the ash left by all parts of plants on combustion, consist, in the case of our cultivated plants, essentially of phosphoric acid, potash, silicic and sulphuric acids, lime, iron, magnesia, and chloride of sodium." It is now fully established "that the constituents of the ash are elements of food, and hence indispensable to the structure of the different parts of the plant."

The few ashes that remain after burning a plant are all that it got necessarily from the soil. From eighty-eight to ninety-nine per cent. of the weight of the plant has escaped into the air, from which, and from water, the plant has derived it immediately or remotely. The composition of their ashes varies in different parts of the same plant and slightly in the same species when grown on different soils; but they are always a valuable manure for the species from which obtained, and, slowly dissolving

*"Barnyard Manure," Farmer's Bulletin No. 21, U. S. Dept. Agri., p. 31.

in the soil, they furnish the roots with just the salts required to nourish the growing plant.

But, in general, over nine pounds in every ten have disappeared under the action of fire. The combustible portions which have been expelled are carbon, hydrogen, oxygen, and a little nitrogen, which have been derived from carbonic acid, water, and ammonia, which are, as elements of food, equally indispensable as the substances of which the ashes of plants are composed.

The incombustible constituents of the plant come from the soil alone, and are taken up by the roots.

After the gaseous constituents of plants are driven off by combustion, the small percentage of ashes remaining, as we have stated, consists of *silicic and phosphoric acids, potash, sulphur, lime, magnesia, iron, chlorine and soda* (the two latter generally unite as chloride of sodium), all of which, in greater or less proportions, enter into the composition of our field and garden crops. These earthy or saline constituents are found within the cells of plants, or deposited as a lining to the cell-walls, or entering into their substance. They are useful to the plant itself, and useful in the plant's products as affording food to man. Some of them are always present in the azotized substances formed by plants. Thus sulphur and the phosphates are, with ammonia, necessary for the formation of albumen, fibrin, and caseine, which are essential constituents of our blood.

Lime generally occurs as a carbonate and sulphate, or gypsum. Partially soluble in water, it is an important ingredient in the soil to most of our cultivated plants. It is indispensable to such plants as beets, potatoes, peas, beans, fruit trees, grasses, and vines, but to Kalmias and coniferous trees it is injurious. Lime in the soil enables it better to absorb and retain heat, and also corrects acidity. It is of great value as an application to cold,

tenacious soils, rendering them of more open texture, and making the organic matters therein available to plants. It, on the other hand, makes light soils more adhesive, acting as an amendment. It decomposes organic matters, whether vegetable or animal, and forms with them a partially soluble compound peculiarly fitted for the food of plants. But as it has the property of setting free ammonia, *it should never be applied in connection with fresh animal manures.* Mixed with *stable manure or guano*, it would speedily free them from nearly all their ammonia, that indispensable and most costly constituent of the food of plants.

This will not happen to any great extent, and there will be little loss, if the mixture takes place in, and both the lime and manure are entirely covered with the soil, which will at once absorb whatever ammonia the lime sets free.

The great value of lime, aside from the small quantity directly available to plants, is in hastening, as above stated, the decomposition of decaying matters in the soil, and rendering them assimilable by plants. The old black mould of kitchen gardens and other soils rich in humus, it will suddenly render wonderfully productive, and they will consequently speedily become exhausted, unless new supplies of organic manures are added. Lime alone, added to a soil, will speedily exhaust it if the crops are removed and no return of manure is made.

Dr. Hilyard, in the Tenth Census Reports on cotton production, makes the following admirable deduction concerning the use of lime in soils:

1. "A more rapid transformation of the vegetable matter into active humus.

2. "The retention of such humus against the oxidizing influences of hot climates.

3. "It renders adequate for more profitable culture percentages of phosphoric acid and potash so small that

in the case of the absence or deficiency of lime, the soil is practically sterile.

4. "It tends to secure the proper conditions of nitrification whereby the inert nitrogen of the soil is rendered available.

5. "It exerts a most important influence upon the flocculation, and therefore upon the tillability of the soil."*

THE INDIRECT ACTION OF MANURES.—Some manures ameliorate the soil by *absorbing and retaining moisture* from the atmosphere. This property is as beneficial to a clay as to a sandy soil during drought, as at such times clays are often baked so as to be impervious to the dew, and suffer nearly or quite as much as more sandy soils. The best absorbents of moisture are stable manure, thoroughly decomposed tan-bark, and the manure of the cow and pig, in the order named. After these come sheep and fowl manure, salt, soot, and even burnt clay is not without its virtue. All these absorbents are much more effectual when finely divided, and the soil itself is a good absorbent in proportion to its *richness*, fineness, and the friability produced by frequent culture. In the power of retaining moisture absorbed, pig manure stands pre-eminent; next that of the horse, then common salt and soot.

Some manures are beneficial in absorbing not only moisture, but nutritious gases from the atmosphere, which they yield to the roots in a concentrated form. All animal and vegetable manures have the power of attracting oxygen from the air during decomposition. Charcoal and all carbonaceous matters have the power of absorbing carbonic acid gas in large quantities, supplying constantly to the roots of plants an atmosphere of carbonic

*Cotton Production—Tenth Census.

acid, which is renewed as quickly as it is abstracted. The same substances are especially valuable for their power of absorbing ammonia. Charcoal will absorb ninety times its volume of ammoniacal gas, which can be separated by simply moistening it with water.

Decayed wood absorbs seventy times its volume, while leaf-mould, perfectly rotted tan-bark, and, in fact, all vegetable manures, are exceedingly valuable in this respect.

Another indirect action of manure in assisting the growth of plants is in *decomposing and rendering available* any stubborn organic substances in the soil. Stable manure, and all decomposing animal and vegetable substances, have a tendency to promote the decay of any organic remains in the soil. All putrescent substances hasten the process of putrefaction in other organic bodies with which they come in contact. Even peat and tan-bark, *mingled with stable dung and kept moist*, are converted into good manure; common salt in small proportions has a similar septic property, and the efficacy of lime in this respect is well known.

Ashes are of equal value, but not so easy to obtain in sufficient quantity. Neither ashes nor lime should ever be mixed with manures that are rich in ammonia, such as cotton seed or animal manures, as they would cause great waste of ammonia by setting it free and permitting it to be lost in the atmosphere.

Inorganic substances are sometimes released from their combinations, and rendered soluble by the application of carbonaceous manures. Ashes from which the soluble potash has been leached, if composted with swamp muck, are enabled to furnish plants with a further supply. By composting the two the value of both is greatly increased. Such a compost may be mixed with ammoniacal manures,

not only without loss, but with decided benefit, and the ammonia will be retained.

Another indirect agency of manures is in protecting plants from sudden changes of temperature. There is no doubt that rich soils and those abounding in animal and vegetable remains, are less liable to change their temperature with the incumbent atmosphere than those of poorer constituents, for the decomposition of manures gives warmth to the soil. Corn can be grown in high latitudes upon rich land only; upon a poor soil it would perish.

The last indirect effect of manures upon plants is to improve the texture of the soils in which they grow. Decomposing in the ground, they leave interstices as they become less in bulk, making it more light and porous. The effect of manure in rendering a stiff soil light and friable is very well known. It is equally true that vegetable manures give to sandy soils greater tenacity, enabling them better to retain moisture and ammonia.

Manures, then, should be adapted to soils and circumstances. Cohesive and binding manures are most suitable for open sands; those of open texture, for stiff clays; those that readily attract and retain moisture, for dry soils; heating, dry, strawy, and turfy manures, for wet or clayey soils; and those of slow decomposition for hungry gravels.

Gypsum.—Of this a very small quantity will suffice. One bushel per acre yearly is all that is needed. In absorbing ammonia from the manure heap, charcoal dust and leaf-mould are much cheaper. It is the cheapest way of supplying the soil with what sulphur is required.

Marl, where it can be obtained, may be applied with advantage, especially to sandy soils. It is generally beneficial in proportion to the quantity of lime it contains.

Some marls contain both phosphate of lime and potash in considerable quantities, and hence are of increased

value. Before largely applying it, experiments should be made on a small scale, as some marls, upon trial, are found to be injurious.

CHARCOAL renders the soil light and friable, gives it a dark color, and additional warmth for early crops. The bed whereon charcoal has been burnt is always marked by a most vigorous growth of plants when it becomes sufficiently mixed with earth. It contains also small quantities of salts of potash and other fertilizing salts.

It absorbs both carbonic acid and ammonia from the air, and yields them to the roots of plants. It is most marked in its effects on plants which require abundant nitrogen. As it is indestructible, its beneficial effects last as long as it remains in the soil, supplying the rootlets of plants with carbonic acid, which is renewed as fast as abstracted. Its good effects begin to be seen when the dust is applied at the rate of forty bushels per acre. Charcoal is invaluable for destroying the odor of decaying animal matter, retaining all the gases in its own substance ready to yield them up for the use of plants. Hence, the best application of this substance is not directly to the soil, but to compost it with putrescent animal matters, urine or night soil, of which it will absorb all the odor and fertilizing gases given off during their decomposition. Composted with the last-named substance, it becomes *poudrette*, and is second only to guano as a fertilizer.

In striking cuttings or potting plants, fine charcoal is a valuable substitute for sand, plants rooting in it with great certainty. Plants will flourish in powdered charcoal alone with considerable vigor, and, added to the other materials used in potting, it is found greatly to promote healthy growth in most plants.

Fine charcoal can be obtained in considerable quantities from the old hearths where it has been burned; also

from the refuse of smiths' shops, founderies, and machine shops. All the refuse of the garden that will not decay, pea-brush, trimmings of trees, cabbage and corn-stalks, together with tan-bark, sawdust, and fresh shavings, may be collected, the coarser materials placed at the bottom and set on fire when the heap is building, then covered with the finer. After beating all well together, it should be covered well with short, moist rubbish, weeds and clods. Bermuda grass turf is the best material for this purpose if you are troubled with it, and it is better if it has been obtained from a clayey loam. After the heap is well on fire, clayey turf, together with the clay of the soil, may be added to the top, and a large quantity of the charcoal mixed with burnt clay is thus prepared. At first there is great difficulty in keeping the piles on fire, and strict attention is required. Thrust a stake in different places, that the fire may run through the entire heap, and if it breaks out in any of these, stop them anew with rubbish and brush, cover with earth, and make holes in new places. When the smoke subsides the heap is charred enough. When finished and the fire put out store it up for use. The mixture thus prepared has been found beneficial in every instance, and is a most valuable manure, especially for roses, producing invariably an abundance of fibrous roots, clean, healthy, vigorous growth, and luxuriant blooms. (*Paul.*)

Besides charcoal, there are many other vegetable substances of great value as absorbents of the fertilizing salts and gases that would otherwise escape from animal manures. Carbonaceous matter of every sort should be provided for this purpose. Gather the leaves of trees of all kinds, including pine straw. They contain many substances necessary for the growth of the plants from which they fall, or available to other plants. Throw them into the stables and yards, moisten them and sprinkle them

with the lime and salt mixture, and if kept in a damp state and turned over once or twice, they form the best manure known for all kinds of trees and shrubs, and indeed afford all the necessary constituents, organic and inorganic, of all cultivated plants.

SWAMP MUCK is another valuable absorbent. Gather the black earth of swamps, place in piles and let it dry out the superfluous moisture, and haul it to the compost heap or yard. Swamp muck, by its elasticity, keeps the soil light and open, and is excellent both for absorbing and retaining moisture therein. It may be reduced with ashes or lime, either of which will destroy all its naturally acid properties. The salt and lime mixture is the best and usually the cheapest for this purpose, but leached ashes mixed with carbonaceous matter have an additional part of their potash rendered soluble and available for plants, and should be used thus where obtainable.

THE LIME AND SALT MIXTURE is thus prepared: Take three bushels of unslaked lime, dissolve a bushel of salt in as little water as possible, and slake the lime therewith. If the lime will not take up all the brine at once (which it will if good and fresh burned), add a little more of the brine daily, turning and adding until all is taken up. Keep it under cover until wanted for use. Of itself it supplies plants with chlorine, lime and soda, and acts like lime or ashes in reducing stubborn vegetable matters and correcting their acid properties.

With a load of swamp earth, mix a bushel and a half of the lime and salt mixture intimately while it is in a moderately moist state, and in thirty days it will be decomposed. Upon a layer of this earth six inches thick, spread a coat of fresh stable manure, each day covering it with ten times its quantity of prepared muck, which will absorb all the gases and salts. Let the pile accumulate until four feet high, and then turn it all over, mix it again,

and cover the whole with a thick coat of prepared muck. If too dry to ferment add water, and in three weeks it will be fit for use, and will be found equal to common stable manure, and is entirely free from insects of all kinds. In reducing composts of all kinds, the heap must be kept moist or no fermentation will be produced. Keeping it "always moist but never leached" is the way to produce a strong compost.

A thick layer of the muck should be kept also in the hog-pens and stables to absorb the urine, removing the solid manure from the latter daily, and the muck at the end of each week. Upon this muck also the house slops of all kinds should be poured, and where charcoal is not employed, a bushel every three days should be thrown into the privy to destroy the offensive gases produced. The muck, whether prepared with the above mixture, with ashes or lime, will retain all the virtues of the animal manure. Neither lime nor ashes, unless in excess, when thus combined with vegetable matters, will drive off the ammonia.

Leaf-Mould, or the black surface soil of the woods, is of still more value. This is free from the acid properties of swamp muck, and may be supplied directly to most plants in the flower garden, many of which will not flourish unless this material is present in the soil. It is of still more importance for potting plants in the greenhouse. For the kitchen and fruit garden it is best composted, like swamp muck, with fresh animal manure. It is indispensable in garden culture.

Tan-Bark is another material abounding in carbon, which may, to some extent, be used as an absorbent of animal manure. It may be beneficially applied directly to strawberries, to which it answers the double purpose of mulching and manure. But the crowns of the plants must not be covered; and for all purposes it should be

obtained as much decomposed as possible. Tan may be applied directly to Irish potatoes when ready to cover in the furrow. After they are dropped and the manure applied, a coat of old tan, composted with ashes or the lime and salt mixture, may be given, and the planting finished by covering this with earth. It improves the yield materially and the quality also, as all carbonaceous matters do. Where swamp muck or leaf-mould can be obtained, it is hardly worth while to use tan as an absorbent of animal manures.

It is not of sufficient value to be worth hauling far. In trenching, it may, with other coarse matters, be mixed with the *bottom* soil to lighten its texture and act as a reservoir of moisture. For corn it may, after composting with ashes, be mixed with the surface soil, when, if not in excess, it will be of some service to the crop.

It is very difficult to reduce, but if kept moist, the lime and salt mixture will do it. It may be strewed in the stock-yard six or eight inches thick, and sprinkled pretty thickly with the mixture. The treading of the stock will mix it. Let the whole be turned over in a moist state once or twice, and in the course of the winter it will become a valuable application to the plants that do well with fresh manure. There are abundant elements of fertility in tan, but it is more difficult to render them available than with any other vegetable substance; and it is, upon the whole, quite a dangerous article to experiment with. Reduced thoroughly by composting it with stable manure, using in this case no lime, and then mixed with decayed leaves and plenty of sharp sand, it makes a tolerable compost for growing those plants which require peat, such as Azaleas and Rhododendrons. Tan, properly composted, will prove of most use in light soils deficient in vegetable matter, and when less decomposed, for opening the texture of close, heavy clays.

Decayed chips, sawdust, shavings, etc., are best applied to Irish potatoes, as directed in the case of tan-bark. They should be covered with soil to promote a more speedy decay. They have much the nature of tan-bark without its acidity, and may be likewise, when somewhat decayed, composted with stable manure and used as peat. All these substances are valuable for burning clay or for charring, and afterwards incorporating them with urine, night soil, or superphosphate of lime. In the case of tan-bark, this is undoubtedly the safest and most profitable way to use it.

GREEN MANURES are various crops, raised to turn into the ground in a fresh state for fertilizing it. For this purpose all the weeds of the garden should be employed while green. Over any vacant spots in the garden not wished to be used in autumn, rye or barley can be sown, which will keep the soil from washing, and when large enough may be either cut for feed, or turned into the soil as the plots are wanted for use. Spinach should be sown in considerable quantities, as it grows all winter, and, spaded into the soil in spring, adds a good deal to its fertility. The seed can be saved in any quantity with little trouble.

But the most fertilizing plants for this purpose are leguminous plants, like the Cowpea, as they draw nourishment largely from the atmosphere, and afford a great amount of foliage for turning under as manure. This class of plants is also quite rich in ammonia.

ANIMAL MANURES.—This is the most important class, and the greatest attention should be paid to collecting, preserving, and economizing them. All animal manures, when compared with the preceding class, are more rich in nitrogen, and more easily decomposed and rendered soluble; but though the effect of this class of substances is much more obvious, it is not so lasting.

Its value consists in part of certain volatile and soluble substances, which, in the common mode of preserving manure, are dissipated in the air or washed away by heavy rains. In this climate it is necessary to shelter manure from the sun and rain. All animal matter is either directly or indirectly derived from vegetable substances; hence, every portion of the same that can be rendered soluble is a valuable food for plants. Among the most important animal substances employed as manures are urine, and dung of all kinds. The first of these is almost invariably wasted, though in the case of the cow, it is of more value than the solid excrements. It should be carefully saved by bedding the yard and stables with swamp muck, wood earth, or some other absorbent. Urine is particularly rich in ammonia. This may be absorbed by the muck or by sprinkling the floor of stables and the manure heap frequently with fine charcoal or gypsum. This substance, sprinkled upon the floors of stables, forms a compound like the urate of commerce, so powerful that five hundred pounds will amply manure an acre. If you can obtain no other absorbent, tan-bark is not without its value, but the weeds, sweepings of walks, and other refuse of the garden, particularly leaf-mould and the dark top-soil of pastures, are to be preferred. Urine may be diluted with three times its bulk of water and permitted to grow stale, and be applied at night or in moist weather directly to the growing crops.

The principal animal manures are those of the horse, the hog, the cow, and the sheep. Of these horse manure is most valuable in its fresh state. That of the hog comes next, then that of the ox, while the cow is at the bottom of the list, because most of the enriching substances in her food go to the formation of milk, leaving the manure comparatively weakened. The richer the food given to animals, the more powerful is the manure. If animal

manures are employed in a fresh state, they should be mixed intimately with the soil, and given to such coarse feeding crops as corn and the garden pea. But nearly all plants do better if the manure is composted and fully fermented before use. Pig manure, used alone, is considered pernicious to the growth of the cabbage and turnip tribe, and gives an unpleasant taste to many other vegetables, but composted with muck or mould, it is much more beneficial as well as more durable.

In managing animal manures, decomposition must be promoted; the volatile parts must be preserved from dissipation in the air, and the soluble portions from being washed out by rains. That it may ferment, it must be kept in a body, that heat may be generated and its natural moisture retained, while beneath it a layer of some absorbent substance should be placed, to receive and retain its soluble parts, and as fast at it is thrown from the stable it should be covered with layers of muck to retain the ammonia. Horse manure, especially, should not be exposed at all; it begins to heat and lose ammonia almost immediately, as may be perceived by the smell. Mix it with other manures and cover it with absorbents as soon as possible. Keep the stable bedded with muck, and over this a good bed of leaves.

THE MANURE OF BIRDS is richer than that of any other animals; as the solid and liquid excrements are mixed together, it is particularly rich in nitrogen and the phosphates. Three or four hundred weight of the manure of pigeons, fowls, turkeys, etc., is of equal value with from fourteen to eighteen loads of animal manure.

NIGHT SOIL and chamber slops should be composted as before directed with charcoal, or the black mould from woods. Gypsum may be added to the mixture; all smell is thus destroyed, and an offensive nuisance is converted into a valuable application to any crop. Where charcoal

is freely used, this substance becomes perfectly inodorous. Guano and poudrette are the best possible manures for the cabbage tribe and other plants that need phosphates and nitrogen. Both these manures are exceedingly powerful, but their effects do not last beyond one season. The fertilizing properties exist in the right proportions to be taken up at once by the plants, and nearly all their nutritive properties are exhausted the season they are applied. If in a hole or dry ditch are deposited all the leaves or vegetable refuse that can be collected, and over this is poured daily the house slops, and all smell prevented by the timely application of charcoal or woods earth, a compost is formed exactly similar in its constituents to farmyard manure, and containing all the eight substances by which plants are artifically fed. (*Lindley.*)

Liquid Manure.—Almost any manure may be applied to the soil with benefit in a liquid state. Liquid manure generally implies urine or the drainings of dung heaps and stables, chiefly consisting of urine and the dissolved excrements of animals. Diluted more or less as required, it can be applied about once a week to plants in any stage of *growth*, and is particularly useful to those grown in pots. The soil should not be oversaturated with it, and it should be used alternately with pure water. Do not give it to plants that are in a state of rest.

Composts.—The composting of manure should take place, as a general thing, as fast as it is made. In the garden, out of sight, there should be a compost heap for receiving all kinds of rubbish that can have the least value as fertilizers. Make a shallow excavation of a square or oblong form, with the bottom sloping to one end. Into this collect the litter and sweepings of the yards, decayed vegetables of all kinds, brine, soapsuds, and slops from the house, woollen rags, leaves, green weeds, and garden refuse. After it has accumulated a

little, turn it over, adding a little of the salt and lime mixture, and keep the whole inodorous by covering it with rich mould or black earth from the woods. If the heap is formed entirely of vegetable materials, ashes or lime should be added; but if it contain animal matter, they would do harm by setting free the ammonia. The heap should not be deep, but, like all other manure heaps, should be kept "always moist, but never leached," by the addition of liquids from the house and kitchen. If this compost be for a sandy soil, the addition of clay would be very beneficial.

Composting is the best way of rendering available all sorts of refuse organic matter, but do not introduce those antagonistic in their effects. For instance, never compost lime with animal matters which, in their decomposition, form ammonia.

Special Composts are prepared for different species of plants, and they are of great utility in floriculture. Composts for plants in pots are made up of loam, leaf-mould, sand, peat, and manure. The loam is the decomposed turf from a rich, old pasture, which should not rest upon clay, and the upper three inches only are taken. It should lie one year before using. Leaf-mould is the dark surface soil of the woods, formed from decayed leaves. Sand should not be from roads: use fine surface or river sand. The manure is unfit to use if less than a year old, and improves by frequent turning, and lying two years. Peat is the black soil from swamps, mingled with very fine sand. It should be exposed a year and frequently turned before using. Black woods earth, mingled with one-third pure sand, is the best substitute. The proportions of the most common composts are given in the following table:

Number of Compost.	*Loam.*	*Leaf-mould.*	*Sand.*	*Peat.*	*Manure.*
1	1	..	..	3	..
2	3	2	1	..	1
3	3	1	1	..	1
4	1	..	..	2	..
5	4	4	1	..	..
6	4	..	1	..	1
7	3	3	1	..	..
8	4	2	1	..	..
9	1	1	..	1	..
10	1	1	1	..	1

The essential elements of plant food—viz., potash, nitrogen and phosphoric acid—may now be purchased in the markets combined in proportions to suit all demands, as complete or partial manures. A short discussion of their origin and properties is not out of place in a book of this character.

1.—POTASH.

The German deposits of crude potash salts furnish the largest supply of this important fertilizer to the markets of the world. The chief forms in which these salts occur in the mines are sulphate and nitrate (chloride) and kainit, which is a combination of chlorides of magnesium and sodium, magnesium sulphate and potassium sulphate. The kainit is largely used in the manufacture of commercial fertilizers containing potash. The ashes from cotton-seed hulls is a valuable source of potash, and a good market for this southern product has been created within the past few years since the sale of cotton-seed oil has become such an important item. The hulls, after extracting the interior of the seeds, are used for fuel in the manufacture of oil, and the resulting ashes are sacked and sold for fertilizers. When the hull ashes are mixed with "nitrogenous organic materials great caution is to be observed, since mixtures of this kind, if kept for any length of time, especially if allowed to become moist,

are likely to ferment with consequent loss of a considerable proportion of nitrogen."*

Cotton-seed-hull ashes contain besides potash seven to eight per cent. of available phosphoric acid, thus making this fertilizer one of the most valuable in the reach of the southern planter.

Table Giving Approximate Amount of Potash in Fertilizing Materials.†

Materials Containing Potash.	*Per Cent. of Actual Potash.*	*Pounds of Actual Potash in 2000 lbs of Material.*
Carnallite	13 to 14	260 to 280
Cotton-seed-hull ashes	15 to 25	300 to 500
Kainit	12 to 14	240 to 280
Krugite	8 to 9	160 to 180
Muriate of potash	50 to 53	1000 to 1060
Nitrate of potash	43 to 44	860 to 880
Sulphate of potash (low grade)	28 to 30	560 to 600
Sulphate of potash (high grade)	48 to 51	960 to 1020
Wood ashes (unleached)	4 to 8	80 to 160
Wood ashes (leached)	1 to 3	20 to 60

2.—NITROGEN.

Nitrogen is derived from several sources—viz.:

1.—Mineral nitrogen compounds.
2.—Vegetable nitrogen compounds.
3.—Animal nitrogen compounds.
4.—From the air by certain growing plants.

The compounds of the first group generally used in the manufacture of commercial fertilizers are known as *sulphate of ammonia* and *nitrate of soda*. The first results from the manufacture of illuminating gas, and yields a high percentage of nitrogen. Nitrate of soda is obtained from the mines in Chili and Peru, and is known in the markets as "Chili salpetre." Its condition when mined is impure, containing a large percentage of common salt, but before shipment the crude product is purified and

* "Fertilizers—Commercial and Domestic," B. B. Ross, Alabama Experiment Station Bulletin No. 63, page 86.

†Geneva (N. Y.) Experiment Station Bulletin No. 94, page 324.

concentrated by leaching until the article which is sold in the United States produces as much as ninety-five per cent. of nitrate of soda, or fifteen to sixteen per cent. of nitrogen in an available form.

In the Southern States we have a most excellent source of nitrogen in cotton seed and cotton-seed meal, which are probably the most important of nitrogen-producing substances. The abundance of cotton seeds in the cotton region supply a cheap origin for nitrogen for the Southern gardeners, and the value of the seed is greatly enhanced from the fact that the two other important plant foods are found in them in quantities of about three per cent. of the former and two per cent. of the latter.

The animal origin of nitrogen is dried blood, fish scraps, tankage and other waste products from slaughter-houses. The blood is dried by steam, and yields from nine to fifteen per cent. nitrogen. The fish scraps also supply large quantities of phosphoric acid.

*Table Giving Approximate Amount of Nitrogen in Fertilizing Material.**

Materials Containing Nitrogen.	*Average Per Cent. Nitrogen.*	*Pounds of Nitrogen in 2,000 lbs. of Material.*
(1) *Mineral materials.*		
Muriate of ammonia	25 to 26	500 to 520
Nitrate of potash	13 to 14	260 to 280
Nitrate of soda	15 to 16	310 to 320
Sulphate of ammonia	19 to 20½	380 to 410
(2) *Vegetable materials.*		
Cotton-seed meal	6 to 7	120 to 140
Tobacco stems	2 to 2½	40 to 50
(3) *Animal materials.*		
Azotin, ammonite	10 to 12	200 to 240
Dried blood	10 to 15	200 to 300
Dried fish	7 to 8	140 to 160
Hair	14 to 16	280 to 320
Meat scraps	10 to 12	200 to 240
Nitrogenous guanos	7 to 8	140 to 160
Oleomargarine refuse	10 to 12	200 to 240
Tankage	7 to 9	140 to 180

*Geneva (N. Y.) Agricultural Experiment Station Bulletin No. 94. page 315.

When peas, clovers, and other leguminous plants are cultivated they have the power of drawing from the atmosphere abundance of nitrogen by means of the peculiar construction of their roots. If a healthy, vigorously growing pea-plant is carefully drawn from the soil and the roots washed, a large number of small tubercles or enlargements will be noticed varying in size over all rootlets. These are storehouses of minute germs which have the power of extracting from the atmosphere quantities of nitrogen, which is absorbed by the plant. When the plant is turned under the soil it not only supplies the needed organic matter, but also, in its decay, leaves in the soil the nitrogen extracted from the air by the germs developed in its roots. Under these conditions it is possible to secure from the air one of the most expensive fertilizers.

3.—PHOSPHORIC ACID.

The apparent effect of phosphates applied to the soil is to stimulate vegetation and to promote the formation of roots. If used for the drainage of pots in the form of broken bones, or at the bottom of vine borders, the roots soon find their way down to, and extract nutriment from them.

The phosphates, like all other plant food, to be of service, must be within the reach of the roots of plants. Fertility is not to be measured by the quantity of plant food a soil contains, but only by that portion which exists in a finely divided state, as it is only with such portions that the rootlets of plants can come in close contact. An ounce of bone in a cubic foot of soil produces no marked effect upon its fertility if unbroken. Dissolve it and let it be distributed through the soil, and it will suffice for the food of one hundred and twenty wheat plants. The most abundant application of earthy phosphates in coarse powder can, in its effects, bear no comparison with a

much less quantity, which, in a state of minute subdivision, is dispersed through every part of the soil. A rootlet requires, where it touches the soil, a most minute portion of food, but it is necessary for its very existence that this minute supply should be at that precise spot. (*Liebig.*)

Dr. L. L. Van Slyke, chemist of the Geneva (New York) Agricultural Station, gives the following excellent account of the origin of phosphoric acid in Bulletin No. 94, New Series, pages 315 to 321:

"Phosphoric acid is generally found in combination with lime (calcium), forming, at least, three different compounds—viz.:

1. Insoluble phosphate of lime.
2. Soluble phosphate of lime.
3. Reverted phosphate of lime.

1.—INSOLUBLE PHOSPHATE OF LIME.

"This is known under several other names, as insoluble calcium phosphate, normal calcium phosphate, tri-calcium phosphate, bone phosphate of lime, etc.

"This form of calcium phosphate is called *insoluble* because it does not dissolve in water.

"It is found in nature in large quantities in several minerals, which will be noticed later. It also constitutes about eighty-five per cent. of the ash or inorganic matter of bones. It is also contained in the excrement of animals, as in guano, etc.

"Insoluble phosphate of lime is found everywhere in the soil. However, in this form, calcium phosphate has the least value for the farmer, because it is not easily dissolved, and cannot, therefore, be taken up and used by the plants, except very slowly. To make the insoluble phosphate available for plants so that they can take it up

the insoluble phosphate must be converted into some form which is soluble—that is, which dissolves in water. This can be done by treating it with sulphuric acid (oil of vitriol).

2.—SOLUBLE PHOSPHATE OF LIME.

"This is known under several other names, as acid phosphate of lime, acid calcium phosphate, acid phosphate, superphosphate of lime, superphosphate, mono calcium phosphate, etc. It is not found actually occurring.

"As indicated above, the soluble calcium phosphate is made by treating the insoluble calcium phosphate with sulphuric acid. By this treatment a portion of the calcium is removed from the phosphate and unites with the sulphuric acid, forming calcium sulphate or sulphate of lime, in addition to the soluble phosphate. This mixture of the soluble phosphate and sulphate of calcium is known as superphosphate of lime. The phosphate in this form, being easily soluble in water, can be readily taken up by plants, and is, therefore, of great value as a fertilizer. The sulphate of lime is also known to have value as a fertilizer. In plain superphosphate of lime there are generally formed about 116 pounds of sulphate of lime for each 100 pounds of soluble phosphate of lime. The value of superphosphates depends upon the amount of soluble phosphate contained in them.

3.—REVERTED PHOSPHATE OF LIME.

"Reverted phosphate of lime is known also as reverted calcium phosphate, precipitated phosphate of lime, dicalcium phosphate, citrate-soluble phosphate, etc.

"When soluble phosphate of lime is allowed to stand for some time it will happen under certain conditions that some of the soluble phosphate is changed into a less soluble form of phosphate. This is not the same form as ordinary insoluble calcium phosphate above described;

for a reverted phosphate, while insoluble in water, can be readily dissolved by weak acids or by water containing carbonic acid or salts of ammonia. Since the soil and plant roots generally contain acids sufficiently strong to dissolve reverted phosphates, phosphoric acid in this form is generally regarded as very nearly equal to soluble phosphates in value as a fertilizer. The term reverted was introduced to express the fact that the phosphoric acid in this form had been once soluble in water, but that it had "reverted," or gone back, to a form insoluble in water.

"The reverted form of phosphoric acid is often found in small quantities in connection with insoluble phosphates, and in larger amounts in guanos; it is also found to a considerable extent in bones and other forms of organic matter.

"*Summary:* Of the forms of phosphate of lime which are used as food for plants, we have—

"*First.* The ordinary *insoluble* phosphate of lime, which can be changed by treatment with sulphuric acid into—

"*Second.* The *soluble* phosphate of lime, and this, on standing, may, under certain conditions, undergo change, forming—

"*Third.* The *reverted* phosphate of lime, which is insoluble in pure water, but soluble in the acids of the soil and plants, and in the water containing carbon dioxide.

"The soluble and reverted forms of phosphoric acid, taken together, are called available phosphoric acid.

"The materials which furnish the greatest proportions of phosphoric acid used in making fertilizers are the following: *Bones, bone-ash, bone-black, bone-meal, phosphatic guano, rock phosphate, superphosphate, Thomas slag, etc.*

"BONES.—Bones consist of two quite different kinds of material. The hard portion consists mostly of calcium phosphate or phosphate of lime, and constitutes from one-

half to three-fifths of the weight of the bone. The remaining portion consists largely of a soft, flesh-like substance called ossein, or, more commonly, gelatin. It is distributed throughout the entire mass of bone, and is rich in nitrogen. When bones are burned, the nitrogenous matter is driven off and only the mineral portion, or phosphate of lime, remains. Bones, such as are used in making commercial fertilizers, contain four to five per cent. nitrogen and from twenty to twenty-five per cent. of phosphoric acid, equivalent to forty-five to fifty-five per cent. of phosphate of lime.

"*Bone-Ash.*—As the name implies, bone-ash is made by simply burning bones in the open air. The nitrogen, of course, is driven off and lost in burning, and the chief constituent is insoluble calcium phosphate, equivalent to thirty to thirty-five or more per cent. of phosphoric acid.

"*Bone-Black*, known also as bone-charcoal, is extensively used in refining sugar. After it has been used several times, portions become useless for refining purposes, and are then sold for fertilizers. Bone-black is made by heating bones in closed vessels, the air being excluded. By heating bones in this manner the fat, water, and nitrogen are removed from the bones, and the bone-black remaining consists mainly of insoluble calcium phosphate and carbon or charcoal. The presence of carbon hinders the decomposition of the phosphate, so that in this form, it is not readily available as food, for plants. Good bone-black may contain thirty or more per cent. of phosphoric acid.

"*Bone-Meal* goes under various names, such as ground-bone, bone-flour, bone-dust, etc. We find in the market *raw* bone-meal and *steamed* bone-meal. Raw bone-meal contains the fat naturally present in bones. The presence of the fat is objectionable, because it makes the grinding

more difficult, and retards the decomposition of the bones in the soil, while fat itself has no value as plant food. When bones are steamed the fat is removed, and the bone is more readily ground. Moreover, the chemical nature of the nitrogen compounds appears to be changed in such a manner that the meal undergoes decomposition in the soil more rapidly than in the case of raw bone. The presence of easily decaying nitrogen compounds in bone hastens, in the process of decomposition, to dissolve more or less of the insoluble phosphate. Bone-meal should contain from three to five per cent. of nitrogen and from twenty to twenty-five per cent. of phosphoric acid; about one-third or one-fourth of the latter appears to be in readily available condition. Raw bone-meal generally contains somewhat more nitrogen (one to two per cent.), and rather less phosphoric acid than steamed bone-meal.

"The fineness of the meal affects its value; the finer the meal the more readily available it is for plant food. On account of the increased demand for bone for various purposes, and on account of their increasing value, there is considerable *tendency to adulterate bone-meal* with such substances as lime, gypsum, coal-ashes, ground oyster-shells, ground rock phosphate, etc.

"PHOSPHATIC GUANOS, OR ROCK GUANOS.—Guanos generally consist chiefly of the dung of sea-fowls, though the term is applied to other animal products. They are generally found in beds resembling earthy deposits. The guanos which are called phosphates contain little or no nitrogen. Their phosphoric acid is generally in the form of insoluble phosphate of lime, iron and alumina. These guanos come mainly from certain islands in the Pacific Ocean, and from Caribbean Sea and West India Islands. The amount of phosphoric acid in different guanos is very variable, ranging from below fifteen to over thirty per cent.

"ROCK PHOSPHATES are known under several different names which generally designate the locality from which they come, as South Carolina Rock, Florida Rock, Tennessee Rock, West India Rock, etc. Other mineral phosphates are known under the names of Apatite, Coprolite and Phosphorite, which are found in various places in America and Europe, and some of which are used in making commercial fertilizers. However, the greatest source of supply of phosphoric acid is the phosphate rock of our Southern States. The rock phosphates are extensively used in making superphosphates. When ground to a very fine flour-like powder, rock phosphates are called "floats." Rock phosphates contain usually from twenty-five to thirty per cent. of phosphoric acid, and some as much as thirty-five to forty per cent.

"SUPERPHOSPHATES are known under several different names, such as acid phosphates, dissolved bone, dissolved rock, etc. Superphosphates are formed by treating some form of insoluble phosphate of lime, as rock phosphate, bone, bone-ash, etc., with sulphuric acid. By this treatment there are formed soluble phosphate of lime and gypsum (sulphate of lime) in nearly equal proportions. The value of a superphosphate depends upon the amount of soluble phosphate of lime present in it, together with the amount of reverted phosphate of lime. The amount of soluble phosphoric acid compounds in superphosphates varies with the kind of phosphate used in making the superphosphate and also with other conditions, which we need not mention here. A good quality of dissolved bone contains twelve to eighteen per cent. of soluble phosphoric acid. Dissolved bone-black contains from below fifteen to seventeen per cent. of soluble phosphoric acid. Superphosphate made from rock phosphate may contain from twelve to eighteen per cent. of soluble phosphoric acid.

"*Thomas Slag* is more familiarly known as *odorless phosphate*. It is also known under several other names, such as basic iron slag, Thomas scoria, phosphate slag, etc. This is a comparatively new source of phosphoric acid compounds. It is a by-product formed in the manufacture of iron and steel from certain kinds of iron ore containing phosphorus compounds. In the process phosphate of lime is formed, which is ground to a fine powder."*

* Geneva, N. Y. Experiment Station Bulletin, No. 94, pp. 315 to 321.

CHAPTER V.

ROTATION OF CROPS.

The same crops cannot be grown from year to year upon the same soil without decreasing its productiveness. All plants more or less exhaust the soil, but not in the same degree, nor in the same manner; hence, as different plants appropriate different substances, the rotation of crops has considerable influence in retaining the fertility of a soil. If the same kind of plant is continued upon the same soil, only a portion of the constituents of the manure applied is used; while by a judicious rotation everything, in the soil or in the manure, suitable for vegetable food, is taken up and appropriated by the crop. However plentiful manure may be, a succession of exhausting crops should not be grown upon the same bed, not only because abundance is no excuse for want of economy, but because manure freshly applied is not so immediately beneficial as those remains of organized matter which by long continuance in the soil have become impalpably divided and diffused through its texture, and of which each succeeding crop consumes a portion.

Some crops are so favorable to weeds, that if continued long upon the same bed, the labor of cultivating them is much increased, while if raised but once in a place and followed by a cleaning crop, the weeds are easily kept under. Besides, many crops planted continually in the same soil are more liable to be attacked by the insects and parasites which are the peculiar enemies of those plants.

Many insects injurious to plants deposit their eggs in the soil which produced the plants they have infested, ready to commit their depredations upon the succeeding

crop; but if this crop is changed to a distant locality, they often perish for want of their proper food. So, many parasites leave their seeds or spores in the soil, to the increased injury of the succeeding crop, if of the same species.

Again, different plants derive their principal nourishment from different depths of soil. The roots of plants exhaust only the portions of soil with which they come in contact. Perpendicular-rooted plants throw out few side roots, and derive most of their nourishment from a considerable depth, while fibrous-rooted plants seek their food near the surface. Plants of the same species extend their roots in a similar direction, and occupy and exhaust the same strata of earth.

Different plants by means of their roots act differently upon the physical nature of the soil. Surface roots spread abroad their tufted fibers, which in their decay break up and lighten the surface soil, while perpendicular roots have a somewhat similar effect upon the deeper strata.

The most exhausting crops are, in general, those which are allowed to perfect their seeds, as they extract from the soil all the essentials of the plant, from the root to the seed. The seeds of many species draw from the soil more of its ammonia, phosphates, etc., than is drawn by all other parts of the plant. Root crops are generally less exhausting, and plants cultivated for their leaves are usually still less so.

Enough has been stated to show the necessity of a change of crops, and the following are found the best rules to observe in practice:

1. Crops of the same species, and even of the same natural order, should not succeed each other.

2. Plants with perpendicular roots should succeed those with spreading and superficial roots, and *vice versa*.

3. Crops which occupy the soil for several years, like asparagus, rhubarb, etc., should be followed by those of short duration.

4. Two crops alike favorable to the growth of weeds should not occupy the soil in succession.

5. Crops abstracting largely from the soil the sulphates, phosphates, and nitrogenous principles, should not follow each other immediately, but be succeeded by those which draw less from the soil and more from the atmosphere. These exhausting crops should follow and be followed by those which bear and will profit by heavy manuring.

6. Plants grown for their roots or bulbs should not follow those grown for the same purpose, and still less should plants grown for their seeds follow each other directly in succession.

The following are found in practice to be convenient crops to succeed each other in rotation, beginning after an application of manure—viz.: Onions, lettuce, cabbage, carrots (manure); or, turnips, celery, peas, potatoes, (manure).

The following is also a very good rotation:

1. The cabbage tribe to be followed by—

2. Alliaceous plants, as onions, leeks, etc., to be followed by legumes, as beans or peas. Peas may be followed the same year with celery.

3. Tap-rooted plants, as carrots, beets, parsnips.

4. Surface roots, as onions, potatoes, turnips.

5. Celery, endive, lettuce, spinach, etc.

Celery is excellent to precede asparagus, onions, cauliflowers, or turnips; old asparagus beds may be used for carrots, potatoes, etc.; strawberries and raspberries may precede the cabbage tribe, cabbage the tap-rooted plants, potatoes the cabbage tribe.

In these rotations it is not necessary to apply manure to every crop. For the bulbous roots, as the onion, and for plants cultivated for their leaves, as spinach and asparagus, the ground can scarcely be too rich; and the bulk of the manures may be applied to them and the cabbage and turnip crops, while for plants raised for seed it is best that the foliage should not be stimulated into too great luxuriance by fresh manuring.

In practice these rules should, as far as possible, be followed, but it is often necessary to vary from them or let a part of the soil lie, for a time, idle. Rotations in gardening become less necessary if the ground is plowed deeply and manured highly. Vacant ground thus treated may be filled at once with any crop ready for planting.

To get the highest possible results from a garden, there must be not only a general rotation of crops year by year, but a number of sub-successions each year, as fast as the crops are removed. One-fourth of an acre thoroughly manured and kept perfectly free from weeds, upon which a constant succession of crops is kept up, will yield more than an acre managed in the common way. It is not, however, always necessary to wait until the crop occupying the soil is removed before another is put in. Simultaneous cropping—that is, making two crops occupy the ground at the same time, as in field culture the cowpea in corn-fields—can often be resorted to in the kitchen garden. In the fruit garden, De Candolle says the vine and the peach can with advantage be grown together, the light shade of the peach not injuring the vines.

Directions to meet all circumstances cannot be given, still the following hints may be suggestive of the best methods to secure in the kitchen garden satisfactory results:

For instance, in the fall a portion of the garden may be

occupied with spinach; this should be heavily manured, and may keep the ground until time to plant melons and other vines, when just enough of the ground may be deeply dug to form the melon hills, and the crop will be ready to remove before the melons begin to run. The melon crop may be followed by one of turnips. All such plants as radish, lettuce, and other small salads, need take up no room; they can, any of them, be raised between the potato beds or drills, or between melon hills, rows of corn, etc., and they will come to perfection before the potato or other crops require the ground. Radishes can be raised between the rows in the beds of all kinds of plants that are slow in coming up, as carrots, parsnips, etc., and will be ready to remove by the time the others come up.

Any vacant spot that occurs early in summer should be occupied with plantings of extra early or sweet corn, potatoes, beets, kidney beans, for preserving for winter use, and cucumbers for pickling. Those coming later in the season may be occupied by sweet potatoes until July, then corn, cowpeas, or rutabaga turnips. Where the early onions grow, both the alleys and the center of the bed may be planted with late cabbages or Siberian kale before much of the crop is removed. Cabbages will head if the winter sorts be planted as late as the early part of August, and early Yorks put out in September, if in rich, moist ground, and well cultivated. Sweet corn may be planted until August. Still later, every unoccupied corner should be covered with turnips and winter radishes, which may cover nearly the whole garden, being sown in drills between the rows of plants not yet quite ready to be removed. After the frost has come, any vacant spaces should be immediately sown with spinach, onions, and other crops for early spring use, or with barley or rye for the cow. The secret of successful cultivation, says Down-

ing, is an abundant supply of manure. A small extent of ground well manured and plowed deeply, by these sub-successions, will produce an enormous amount of vegetables, while the same surface only needs to be hoed, manured, and kept free from weeds, as if it produced but one crop. To be sure, more manure and more labor are needed, but nothing like the amount which would be required to produce the same crops without these sub-successions. Many other sub-successions will occur to a thoughtful gardener, but to derive the full benefit of them the grounds should be well prepared when the garden is formed.

PROFITS OF GARDENING.—The results of the above mode of procedure, in the case of the garden of the Retreat for the Insane at Utica, New York, were published by Dr. Brigham. The land was good and yearly manured. The product was as follows on one and one-fourth acres of land: 1,100 heads lettuce, large; 1,400 heads cabbage, large; 700 bunches radishes; 250 bunches asparagus; 300 bunches rhubarb; 14 bushels pods marrowfat peas; 40 bushels beans; sweet corn (three plantings), 419 dozen; summer squash, 715 dozen; squash peppers, 45 dozen; cucumbers, 756 dozen; cucumber pickles, 7 barrels; beets, 147 bushels; carrots, 29 bushels; parsnips, 26 bushels; onions, 120 bushels; turnips, 80 bushels; early potatoes, 35 bushels; tomatoes, 40 bushels; winter squash, 7 wagon loads; celery, 500 heads—all worth $621 in the Utica market, but in use supplying 130 persons with all they could consume. Only one man was required to do all the necessary labor.

The supply of northern markets with early fruits and vegetables is becoming yearly more and more profitable to all points which have direct steam communication with their great cities. Charleston, Savannah, and Norfolk now ship very largely asparagus, peas, snap beans,

cucumbers, and many other vegetables, and a variety of fruits from which remunerative profits are returned. The extreme earliness of the crops in the South enables the market gardeners to place their products on the markets of New York and other large northern cities some time before the gardens more northerly situated are ready to ship, and hence the benefits of the advanced prices are reaped.

Forwarding Early Crops.—Early crops in the open air should be planted in a sheltered situation, on a dark-colored, silicious soil. It may be brought to a proper state by the admixture of sand and charcoal. Crops, on the contrary, may be retarded by planting in a border sheltered from the sun, and of a lighter color and more aluminous. There are many plants which do much better if sown in the fall. Rhubarb, parsley, etc., come up more freely if suffered to be in the ground all winter. Potatoes, too, may be early planted, and if they come up, should be sheltered by a covering of straw or litter, added from time to time to keep them from frost. Cabbage, cauliflower, broccoli, etc., sown in autumn and transplanted, may be kept out all winter in boxes made by nailing four pieces of boards together, eight inches wide. Cut the pieces twelve inches long at the bottom, and ten at the top; nail them together at the corners. After the frosts begin to be severe, throw in a handful of loose straw, which will prevent the sudden freezing and thawing of the plants. Great care should be taken to produce early crops, as they are less liable to be injured by insects or weeds, and very much increase the satisfaction of gardening. Early plants may be obtained by sowing them in a box set in a warm window, or may be raised in autumn and protected in winter in a cold frame or pit, or grown any time during winter in a hot-bed for those more delicate, or in a cold-frame under glass for the hardier kinds. Such plants,

when set out in the spring, need to be gradually hardened, and then require shading a few days until established. Radishes sown under glass without heat early in January are generally fit for use early in March. But to forward plants with any success requires suitable structures for the purpose.

CHAPTER VI.

HOT-BEDS, COLD FRAMES, AND PITS.

FRAMES OR HOT-BEDS are most usually employed for forwarding plants. The frame for general use has from three to five sashes (see figure 5), and is made for convenience about four and a half or five feet wide, and the length depends on the number of sashes, which are usually about forty inches wide. Use the smallest glass

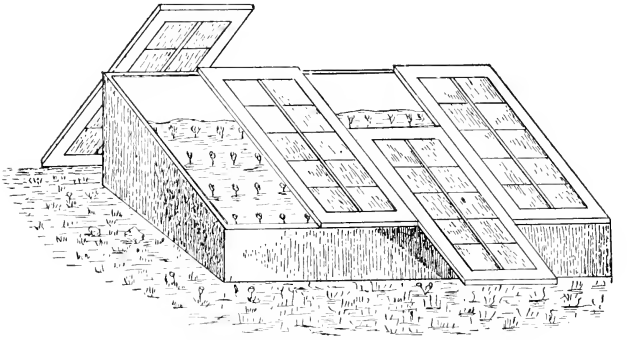

Fig. 5 Hot-Bed and Frame.

you can obtain, certainly not over seven by nine; a smaller size is preferable, as it is not so liable to be broken, and can be more readily repaired. These sashes are made without cross-bars, the glass overlapping like the shingles of a house, and resting on bars extending lengthwise of the sash. The lap of each pane of glass need not be over half an inch, and if the glass is set in the sash when freshly painted with two coats of paint, no puttying is necessary, if the sash is well made. The

frame should be made of inch and a half plank as high again in the back as in the front, to give the sashes the proper slope to the sun, and sufficient inclination to carry off the wet. The front, of course, is towards the south. Let the back and front be nailed to corner posts, so as to admit the ends to fit in neatly, which ends are to be made fast to the posts by common carriage bolts, in order that the frame may be taken asunder to store when not in use. All joints in the sides and ends should be tongued and grooved to prevent the admission of cold air or the loss of warm air from the bed. Each end should be made an inch and a half higher than the back and front, and grooved out one-half its thickness, to permit the sash to slide and leave the other half to support the outside. At the corner, also, of each sash, let another piece of scantling be placed, and on the top of these, narrow strips the length of the sash are to be nailed, for the sash to slide upon. Between the sashes nail an inch strip a little thicker than the sash to the narrow plank on which they slide, and put on the sash; and upon this strip, in cold weather, lay another narrow strip, projecting over the sash a little, to cover the joint and keep out the cold. Provide for the bed a full supply of good horse manure from the stable, mixed with moist litter, preferring that which is fresh, moist and full of heat. If there is not sufficient litter in the mass the heat will not be lasting; so as a substitute add oak-leaves or tan-bark. There should be at least one-third litter in the heap. Shake it up and mix it well together, sprinkling with water if dry, and throw it into a compact heap to ferment. In two or three days, if warm, or if cold, in a week, turn it over, and if dry and musty in any part, water again. Let it alone two or three days longer, and then work it over thoroughly, as before, and water if necessary. In a dry, sheltered situation opening to the south, mark out the

dimensions of the bed, making it fully a foot longer and wider than the frame each way. Throw out the earth about ten or twelve inches deep. Then begin to form the bed by spreading a thin layer of the prepared manure upon the ground, mixing the long and short well together. Upon this spread other layers mixed in the same manner, beating each layer with the back of the fork, but not too heavily, to keep it level, and equally firm throughout. Stakes should be placed at the corners to work to. The edges should be kept true and the corners firm, to do which the outside of each layer must be first laid down, and to make the manure keep in place a proper admixture of long litter is required. Continue until the bed is three feet above the surface, then spread the fine manure that is left evenly over the top, and water freely. As soon as finished let the frame and glass be put on with care, and keep them close until the heat rises and a steam appears upon the glass. As soon as the heat rises, give air at noon each day, but keep closed in the evening and at night, unless the heat is very violent, when a little air should be given. In three days, if the manure was sufficiently moist, the bed will be ready for use. If it has settled unequally, raise the frame and level the surface. Place in the frame six inches of fine, dark-colored, sandy garden soil, spread it evenly, and put on the sash. When warmed through sow in pots plunged in the mould, or in small drills from one-eighth of an inch to an inch deep, varying in depth with the size of the seeds, and cover by sifting fine earth on the surface. Water gently by sprinkling with tepid water through the fine rose of a watering pot. When the plants appear they should have air every day freely (unless absolutely freezing), which will bring them up strong, and prevent their dropping off by excess of confined moisture. There are very few days which will not permit opening the bed, not by sliding down the

sashes, but by raising them at the back, holding them open by a triangular block to slip in so that they can be opened from two to five inches. Open the bed in the middle of the day, as above, but close early that the plants may not become chilled. During warm, gentle rains, the sash should be opened, but closed very carefully during cold or heavy washing storms. About 60° is the proper temperature; it should not rise above 75°. Such a bed as this is invaluable for striking cuttings of all kinds, in which case there should be an inch of clear river sand or charcoal spread over the surface. Annuals of all kinds for the flower garden, tomatoes, peppers, cabbage and lettuce plants, etc., will be ready, if the bed is made in January, for transplanting quite as soon as they can be removed with safety. Make the bed six or eight weeks before the plants will be required. The quantity of manure required to form a hot-bed varies with the season and external temperature, a larger bulk being needed in January than at a later season. Even a small bed should have the mass not less than five feet long by four feet wide, to maintain the proper heat. If the soil whereon it stands is clayey the whole bed should be made above ground, as the water settling in the trench would check the heat of the entire bed. If the bed is made early in the season it will require the application of fresh materials at the sides or "linings" to keep it at the proper temperature.

The best substitute for stable manure in forming a hot-bed is spent tan, but to keep it in its position a plank bin or a brick pit is required. It takes more time for the heat to rise, but it is longer continued, milder and more manageable than stable manure, and is quite sufficient for a seed-bed. A little slightly fermented stable manure is needed to be added to the center of the bed, as it will start fermentation sooner.

In sowing the bed let the more tender plants, as egg-plants, peppers, etc., be sown under the same sash, and separated by a thin plank partition under the cross-bar from the rest of the frame. The finer and more delicate seeds will require the sash above them to be shaded until the plants appear, or each pot may be separately covered until the seeds are up. At night, if cold, cover the bed with plank shutters, old carpets, or mats. Gradually, as the plants grow strong, accustom them to the air as the season grows mild. This can be done by opening the frames entirely during the day, and leaving them exposed during mild nights, or by transferring them to the cold-frame.

COLD FRAMES are made just like those for the hot-bed, only the box need not be over fifteen inches high at the back, and are excellent for wintering nearly hardy plants of all kinds, and also for forwarding the more hardy plants, as hardy annuals, cabbage, lettuce, etc. Indeed, they are quite as indispensable as the hot-bed, and less expensive, as they require no manure, but rest directly on the soil. They are also of great service in hardening off hot-bed stock, which should be transferred to them before it is set out in the open ground. In very severe weather, the heat may be kept in by earthing up the sides and covering the sash with mats during the night. Air should always be given when the weather will admit, or the plants will grow up yellow and spindling. In managing frames, the secret of success is to give plenty of air. Plants raised in cold frames are generally more hardy and desirable than those from a hot-bed, unless the latter are repotted early, and when re-established, transferred to the cold frame, to harden them. A cold frame or pit covered with tiffany (a prepared thin cotton cloth) is even better than one covered with glass, for the purpose of hardening off young stock.

Frames of all kinds should be painted of a light color, every year, both for the preservation of the wood and for the destruction of insects and their eggs, that are concealed in their crevices and angles. A frame for raising seedlings or striking cuttings need not be over eighteen inches deep at the back, to nine inches in front, as it is important to keep the seedlings near the glass.

PITS.—Figure 6 shows a section of a lean-to pit, in which tall plants may be set upon the bottom, while a stage may be put in to bring small plants near the glass. All pits should be built of brick, and those with the walls built hollow above the surface are preferable. In a pit six feet wide the back should be about fifteen to eighteen inches higher than the front. Pits are also useful in protecting delicate plants in summer, from heavy rains and scorching suns, and for bringing up many seedlings in the spring that do not require artificial heat. In all cases ample provision must be made for drainage, as plants will not flourish in damp, confined air. When a pit is desired merely to *preserve* plants during the winter, it is better that the glass should face rather to the north, that is from north-east to north-west, in order that growth may not be excited, and the plants thus kept perfectly at rest during the winter. If the pit faces any other quarter the air within gets heated, and the plants keep on growing late in the autumn, are stimulated into temporary growth too early in the spring, and are much more in danger of destruction by frost. The pit should be kept as dry as possible and ventilated daily when the frost is

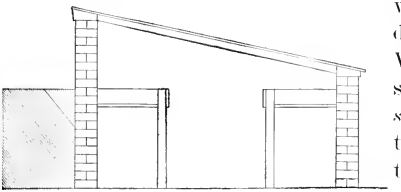

Fig. 6—Section of Pit.

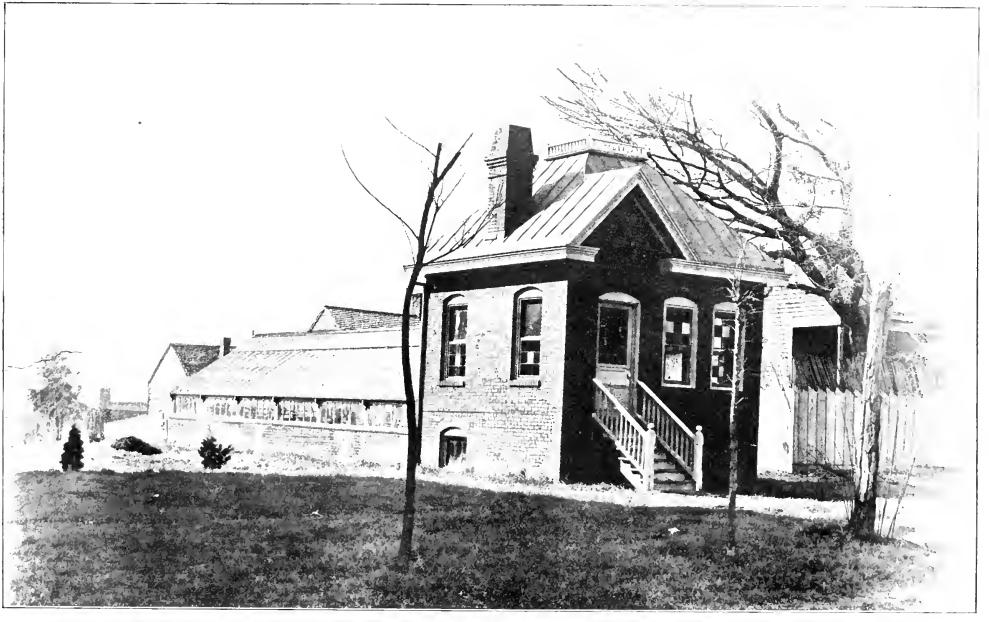

Plate 1.—Green House—Small Plan—Exterior.

not too severe, and to protect the roots of plants from frost and to prevent the necessity of frequent waterings, the pots should be plunged in some dry material, as sand or tan-bark. Very little water should be given to plants in their dormant state, for they cannot assimilate it. Many plants, as geraniums, etc., in such a pit will require but one or two waterings during an entire winter. Plants thus managed will endure a very low temperature, and start into more vigorous growth in spring.

At night, if cold, and during severe weather by day, it will be necessary to cover the glass with mats or shutters, to prevent the frost from penetrating and the heat from being lost by radiation.

GREENHOUSE.—In most cases, persons who are financially able to equip a large garden are also in position to desire and secure a greenhouse, which is far preferable to hot-beds, pits or other like devices for protecting tender plants. An economical house can be constructed in accordance with the plan recommended by Peter Henderson some years since, and thus concisely described by W. F. Massey, horticulturist of the North Carolina Experiment Station.

This style of greenhouse is made with the same kind of sash which is used in the construction of hot-beds and cold frames. The house is made by setting posts in line, four feet apart to make the side walls. These side walls are four feet high and ten feet apart, this being the width of the house. The tops of the posts should be cut to the slope of the roof, and a plate nailed thereon, on which the sashes are to rest. This plate should project inside and out, so as to allow of a gutter being formed on its outer edge, for it is desirable to have a tank inside to catch the rain water from the roof for watering purposes. The ridge pole of the roof should be cut so that the ends of the sashes which are to form the roof will rest on a

Plate 2.—Greenhouse—Interior.

shoulder and come flush with the top. Each alternate pair of sash is screwed fast to the ridge pole at the top and to the plate at the bottom, thus forming rafters and giving strength to the structure. The other pairs are to be hinged to the plate at the wall and held in place at the top by a hook, or by an iron strap punched with holes to catch on a pin fixed to the ridge pole, so that they can be propped up to admit air to the house. If the house is

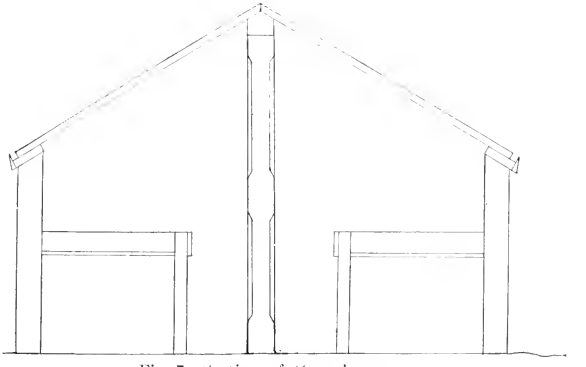

Fig. 7—Section of Greenhouse.

to be heated by an ordinary brick flue it should not be more than forty or fifty feet long. A door wide enough to admit a wheelbarrow should be in each end, and walk through the center. Benches are to be made on each side for holding soil or for placing flower-pots or boxes. These benches and the whole house can be constructed of rough lumber, with the cracks battened. The greenhouse should run north and south, and at the north end a shed should be made for a work room, and into which the furnace door is to open, so as to keep the smoke and dust from the house. The furnace is placed in a pit four feet below the level of the house, and is made of brick, with

an ordinary cast-iron door and ash pit. An arch is turned over the fire-box, and the flue is built from the rear end on a sharp ascent to the level of the floor of the house. It should then be built along under the side benches, on a slight ascent, the whole length of the house, across the farther end and back to the chimney over the furnace. The first ten or fifteen feet should always be made of brick, the remainder of six-inch terra cotta pipe. The furnace may be made to burn wood, and in that case no grate bars will be needed, so the fire can be regulated by a draft hole in the door. But a coal-burning furnace is far more convenient, and the fire will last longer. For seed-sowing purposes it is better to have the flue boxed in under the benches, but in this case hinged doors should be made along the walk, so as to let more heat out in the house when needed.

A greenhouse of this character can be built 10x50 feet for about $150. For heating more thoroughly and satisfactorily than can be accomplished with the brick furnace above described it is best to use a boiler and circulate hot water or steam in iron pipes. This method of heating will slightly increase the cost estimated above.

CHAPTER VII.

PACKING AND MARKETING THE CROP.

Trucking in the South is an industry of comparatively recent years, and has not become near so extensive as it is conducted in most of the Northern States. However, the demand for early vegetables and fruits has grown year by year to such an extent that southern growers, particularly those living near the main thoroughfares, are endeavoring to place the products of their gardens in the large cities of the North as early as possible, so as to reap the benefits of the advanced prices before the less favored gardeners of the colder climates are prepared to harvest and market their crops. Along the Atlantic sea-border, and in some portions of the Gulf regions, market gardens are to be found which have been more or less profitable to the owners for many years. These are to be found along the Mississippi bottoms near the city of New Orleans; near Savannah, Georgia; Charleston, South Carolina; and Norfolk, Virginia. Whenever the railroads penetrating the South wake up to the fact that this industry adds a new source of revenue to the bank account of the companies, and reduce freight rates on vegetables and fruits, providing, also, quick and safe transportation to New York or elsewhere for the perishable products of the gardens, a much larger number of men will engage in the enterprise.

There are so many vegetables and fruits which can be grown to perfection only in southern climates, and which will always command a fair price if they could be promptly placed in the markets of New York or Chicago without incurring the ruinous freight rates demanded by

our railroads, that it would pay the market gardeners in the South to grow these alone; but the mild climate and the almost continuous growth of vegetation in the southern latitudes enable the gardener to raise most of the vegetables known, and of a superior quality, earlier and with less expense than the truck farmers in the neighborhood of New York. It is gratifying to note, however, that in a few sections of the South some of the railroads are making an effort to encourage trucking, and for that reason, in those sections, the industry is rapidly growing.

Growing vegetables and fruits for the market is not an easy enterprise, and it requires more skill, knowledge and experience than the cultivation of the products of the garden for home consumption. The market must be closely studied, so as to know when to ship and what to ship in order to reap the best prices; and the gardener will frequently consult with honest and experienced commission merchants in regard to these important particulars. A visit to the city now and then will well repay the outlay and time spent in the knowledge gained in reference to the methods of disposing of vegetables and fruits and the advantage accruing to the shipper in carefully packing and sorting his produce. The assorting, packing and shipping requires a degree of skill and experience only to be obtained after some years of actual engagement in packing and marketing the crops of the garden. To those who desire to try their fortunes in the profession of market gardening, the following outline of the requisites for a successful prosecution of the work will be of service:

After the land has been properly prepared to produce the best quality of vegetables and fruits, and a market has been selected in which to dispose of the crop, the most important equipment is the packing-house with its

facilities for properly handling and securely packing the material with the least labor, expense and chance of injury to the crop.

This packing-house should be located in the most convenient position for handling the vegetables and fruits, so that the distance for hauling from the field will be reduced, and at the same time easy access will be obtained to the thoroughfare leading to the depot. This matter, of course, can only be determined by the circumstances and facilities surrounding the location of the garden and its approaches. The building should be airy, with ample room for all purposes for which it is constructed. There must be an entrance for the crop from the fields and another for transporting the filled crates and packages to the depot for shipment. The driveway in both instances should be so built that there will be as little lifting as possible, in order to reduce to a minimum the expenditure of labor and the chance of injury to the tender products of the farm.

There should be at least three compartments in the building; one in which to store the fruit and vegetables, where the temperature can be kept to a uniform degree. This may be called a cooling room, and is a necessity in the proper handling of vegetables and fruits. Some products of the farm would certainly spoil before reaching market if packed before first being stored in the cooling room. Another advantage of this room is that it permits of shrinkage in some varieties of fruits before packing, thus reducing the trouble of loose packages on reaching the destination, particularly if shipped to a considerable distance from the farm. Another room should be provided for storing the crates, baskets and other materials used in making the packages. This room should be darkened, but at the same time well ventilated and dry, so that the wood will not stain and thus lose its

attractive, clean, fresh looks. The remaining room should be large and provided with ample light and facilities for rapidly assorting and packing. Benches or long tables to hold the fruit and vegetables, to permit of the greatest convenience to the packers, should be arranged around this room, and in easy reach above them should be shelves containing the empty crates and baskets to be used in the day's operation. As rapidly as the baskets and crates are packed they should be transferred to a central table, where the tops are wired or nailed on, and they are conveniently piled for loading on the wagons for transportation to the depot.

One of the indispensable requirements of the packing-house is cleanliness in all departments. This is necessary not only to insure clean condition of the fruit in the crates and baskets, but also to prevent the presence of disease, which will surely cause much of the shipment to decay before it reaches the market. No vegetable or fruit that is at all faulty should be allowed to enter the packing-house, if honest and first-class work is desired.

THE CRATES, BOXES AND BASKETS.—These are now supplied by the trade, so that it is not necessary to make them in the packing-houses, as was the case in former years. It is still the practice, however, with some truckers to make their own crates, and, even when they are purchased they come to the house "knocked down," requiring simply a hammer and nails to put them together.

A variety of wood has been tried in making the crates, but experience has proven that the sap wood from the Georgia pine furnishes the best material, because there is strength, elasticity, and absence of odors so frequently found in other woods.

The grape basket, illustrated in Figure 8, is the usual form adopted by market gardeners for displaying this

fruit. There are two sizes made, one holding five pounds and the other ten. The name of the variety of the grape as well as the name of the grower should be plainly stamped on the basket after it is packed. If a quantity of small fruit like strawberries is to be shipped to a distance the strawberry boxes are packed in a large market basket shown in Figure 9.

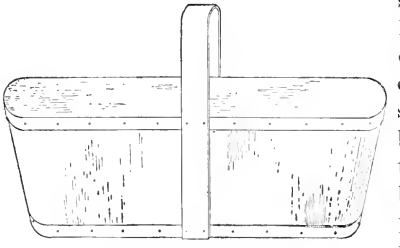

Fig. 8—Fruit Basket.

There are also two sizes of this larger case, one containing eight three-pound boxes, and the other eight five-pound boxes. These are light, made of open work, so that ample air reaches the fruit. This method of packing is greatly appreciated by the retail dealers.

For the shipment of other kinds of fruits and vegetables the crates illustrated in Figures 10 and 11 are in common use, particularly in the South. Figure 10 is a bushel crate, which holds a little more than a bushel. The barrel crate is Figure 11, which has a dimension of 11″x20″x36″.

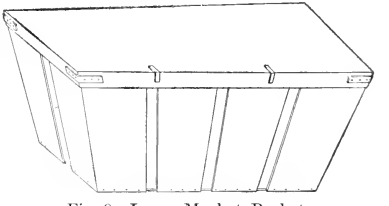

Fig. 9—Large Market Basket.

Other styles of baskets and crates are used in different sections of the country, but the ones illustrated may be called the standard kinds for southern truckers, at least. In shipping potatoes the ordinary

flour-barrel is sometimes used with holes cut in the sides or ends to permit of ventilation.

The following points in reference to crates and packing were extracted from the *American Garden*, and, although they were written for special localities, they nevertheless are applicable to all sections of the country:

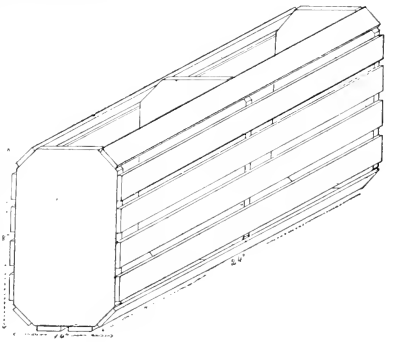

Fig. 10—Busnel Crate.

1. The difference in the construction of the 32-quart strawberry crates lies wholly in the strength and variation in the price; the cheaper grade, however, will not stand the hard usage it is subjected to in shipment. All fruits sold by the northern truckers are packed in these 32-quart crates, such as blackberries, cranberries, and the like.

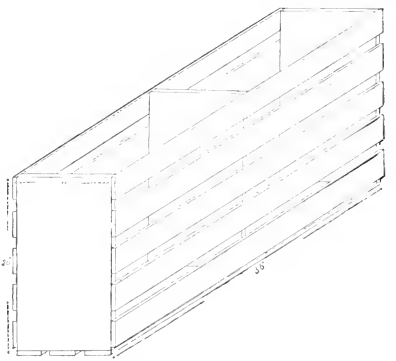

Fig. 11—Barrel Crate.

2. The 45 or 60-pint raspberry crates are more applicable to all purposes than the strawberry crates. They will hold from eight to twelve 10-pound baskets of grapes, which

are safely and easily handled in this manner. In general shape and construction they are very much like the crate illustrated in Figure 9.

3. Fancy peaches are put up in pony baskets and crated. This will enable the dealer to display the fruit without disturbing it from the condition in which it was placed in the packing-house. Pears are also put up in the same manner. The expense, of course, is greater than that incurred in packing these fruits in barrel or bushel crates, but the attractive looks given to the fruit will, in most instances, warrant an increase in price, which will compensate for the extra trouble and expense.

4. Currants are generally shipped in quart strawberry baskets. Cherries are sent to market in 10-pound grape baskets; while choice plums find their way into the markets in both the quart and 5-pound grape baskets. The inferior grades of plums are sent out in kegs and half-barrels.

5. Vegetables are shipped in all kinds of shapes. Potatoes, peas, etc., are packed in boxes, barrels, baskets and bags. Onions are generally sent in crates, while beets, carrots, turnips and other root crops reach the market in boxes and barrels.

6. It is a misfortune, however, that the law does not regulate in all States the standard sizes and styles of packages in which fruits and vegetables are sent to the market, so that the buyer would know just how much he is buying, but it is now in most sections of the country mostly guess work.

7. The quality and the condition of the fruit or vegetables when they reach the market are of prime importance. Poor grades and bad condition will surely lose customers, while first-class crops, neatly and honestly packed, will gradually grow in favor and demand. Except in those instances where the customer becomes

familiar with certain varieties and prefers them, the looks of the crops displayed for sale have much to do with its prompt disposal. For this reason the fruit and vegetables should be carefully graded before packing, and the marks placed on the crates, clearly indicating which are first class and which are second. This method honestly carried out, will establish confidence in the shipper, and the products of his farm will be in demand. Inferior grades should never be placed in the same crate with first-class products. Everything is to be lost by such method and nothing to be gained.

The method adopted by many market gardeners in gathering the crop and checking the work of hired labor

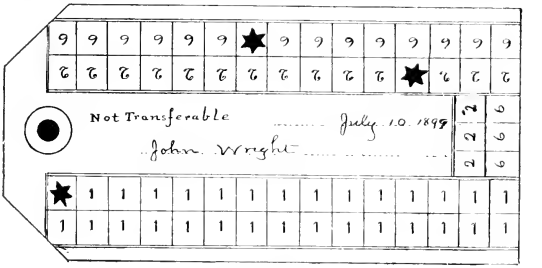

Fig. 12—Picker's Tag.

is as follows: Each picker is provided with trays holding such a number of quarts, and when one of these trays is filled to the standard measure it is placed in charge of a foreman, who gives the picker a ticket or check (Figure 12) bearing his or her name and punched to designate the number of quarts picked, as well as the condition of the fruit. The trays, as they accumulate in sufficient numbers at any one place in the orchard or garden, are loaded on suitable trucks or wagons and carried to the packing-house.

CHAPTER VIII.

INSECTS, FUNGI, PLANT DISEASES—SPRAYING APPARATUS AND METHODS.

No plant, no part of a plant is exempt from the attacks of insects. One devours its tender leaf as it issues from the ground; another preys upon the root, and the plant perishes; another burrows into the stem, boring it in every direction until the stem is broken off by the wind. The caterpillar preys upon the leaves when the plant gets more mature, while the black grub cuts off the young plant just as it is shooting into growth. Some feed upon the flowers, while others devour the matured fruit or seed.

Insects are on the increase in American gardens, partly from the fact that the destruction of forest trees and wild plants has driven them to the cultivated ones for food (the apple-tree borer, for instance, originally subsisting on the thorn), partly from being constantly imported from all other countries from which seeds and plants are brought, and partly from the diminution of birds and other enemies by which they are naturally held in check.

Insects are a most extensive class of animals. They are destitute of an internal skeleton, but possess a sort of external one, serving both for skin and bones, and divided into numerous segments connected together by slender points of attachment. They all have six or more articulated legs, and are generally oviparous, or produced from eggs. They possess sight, hearing, smell, and touch at least—senses in common with those of the superior animals. They do not breathe through the mouth or nostrils, but through vessels for the reception of air, called spiracula, placed along each side of the body.

Nearly all insects have four stages of existence. First, eggs which hatch into larvae; these change into pupae, where they remain dormant for a longer or shorter period, and from which they emerge at last as perfect insects. Some insects, however, bring forth their young alive, as well as deposit eggs. In others, as the Orthoptera, or grasshopper family, the young has nearly the form of a perfect insect. Some insects are injurious only in one stage of their existence; others at all times, when not in a dormant state.

A knowledge of the habits and transformations of insects is necessary to detect how and at what period of their existence they can best be destroyed, or in what manner vegetation can best be shielded from their attacks.

By many insects plants are at once destroyed; by others wounds are inflicted that end in a diseased condition of the parts affected, which is communicated to the whole plant. Plants in a weak or diseased state are far more liable to be attacked by insects than those which are healthy and vigorous.

CLASSIFICATION OF INSECTS AND DISEASES.

1. Insects which attack the leaves.
2. Insects which suck the juices from plants.
3. Insects which bore into the stem and feed upon the wood of the plant.
4. Insects which attack the roots.
5. Fungi living on the outside surfaces of plants.
6. Fungi which penetrate the tissues.

In the treatment of these pests a knowledge of the habits of the insect or fungus is necessary. The remedy that will destroy one group may not check another; so that certain general rules must be followed when efforts are made to combat the enemies. First determine what

is the character of the trouble, and then use the remedy which experienced entomologists recommend.

1. *Insects which Attack the Leaves.*—These are comparatively easy to destroy by spraying poisons on the foliage, so that the insects will take the poison in their food; or the plant may be enveloped with poisonous gas which will cause death to the enemy.

2. *Insects which Suck the Juices from the Plants.*—This group contains the plant lice, which puncture the tender bark and suck out the vital juices of the plant. They belong to the order of insects known as *Hemiptera*, or true bugs. Their bodies are pear shaped, and from the upper part of the rear end are two projections from which a clear, sweetish fluid exudes. Ants and bees are exceedingly fond of this exudation, and on those plants that lice infest it is quite common to see ants climbing in considerable numbers feeding on the honey thus manufactured by these lice. One remarkable fact in the life history of these animals is the reproduction of the young without the intervention of the male, and also the fact that the mother, while she is feeding, produces the living young without first laying eggs. This process of multiplication goes on until late in the fall, when males are produced, which fertilize the females, and eggs are laid in secure places against the winter, and next spring these hatch out into female lice, and the process of reproduction is continued without the laying of eggs. It can be readily understood, therefore, how rapidly the multiplication of these animals will take place, and the plant must soon succumb, unless measures are used to kill the lice at once. During the winter months all rubbish must be burned in order to destroy the eggs laid by the lice the preceding season. When the plants are growing they must be constantly examined and all lice killed. One female deprived of her life early in the season is equivalent to

the destruction of a great many several weeks later, because of the rapid multiplication of the animals, as already stated. The use of poisons like Paris green will produce but little, if any, effect upon these insects, since they get their food by inserting their sucking organs into the tissues of the plants out of reach of the poison, which is only on the surface. Spraying with kerosene emulsion and enveloping the plant with gas will accomplish much, however, in the destruction of the lice. For the preparation of this emulsion see table opposite page 184.

3. *Insects which Bore into the Stem and Feed upon the Wood of the Plant.*—These insects must be circumvented by placing on the body of the plant preparations which will prohibit the deposit of eggs; or by washing the trunk with poisons which will destroy the young grubs as they cut into the bark. A good preparation is a glue containing Paris green. After the insect has entered the tree a wire must be used to destroy it, or the place attacked may be cut and the grub destroyed; but, of course, the tree is considerably injured by such treatment, particularly if the insect has penetrated to considerable depths.

4. *Insects which Attack the Roots.*—The treatment of plants which are subjected to the attacks of these animals is almost hopeless because of the nature of the soil and the danger of destroying the delicate roots by the use of strong chemicals. The best method now known is crop rotation, or the starving of the animals by the cultivation of those plants known to be exempt from their attacks.

5. *Fungi Living on the Outside Surfaces of Plants.*—These comprise the mildews and moulds generally noticed on the young, tender shoots and leaves of many plants when they are in the condition for the favorable growth of these diseases. The remedy is in the use of sulphur vapor.

6. *Fungi which Penetrate the Tissues.*—These are the rusts, smuts, spot-fungi, etc., found growing on the tender

portions of many of our cultivated and wild plants. After they penetrate the tissues it is next to impossible to destroy them without also killing the plant. The treatment must be applied when the fungus is young, and the parts of the plant susceptible to the attack must be covered with the chemical which will prevent the growth of the fungus. When plants become thoroughly infested with this disease the best thing to do is to remove them and burn them. In the case of trees vigorous pruning sometimes prevents the spread of the trouble, and may eventually eliminate the disease entirely. The reader is referred to table opposite page 184 for the methods recommended for the treatment of fungous diseases.

Preventive measures are of more value than remedial, in protecting plants from insects. Among those most likely to be of value, are the following:

Rotation of Crops.—Each species of insect generally feeds on the same species of plant, or at least on plants of the same natural family; hence a constant change of crop prevents the forthcoming brood from finding their proper food, and many of them perish. This is, however, more applicable in the case of field crops than in orchards and gardens.

Decaying Trees.—Destroy all decaying trees in the neighborhood of orchards and gardens, as they are often a refuge, and tend to propagate insects destructive to the neighboring crops.

Scraping of the rough bark of trees and washing them with tobacco water, lime water, or a wash of lime, sulphur and clay, or a solution of potash, destroys the hiding places of insects, and many of the insects themselves which infest trees.

Birds and Other Animals.—The encouragement of insectivorous birds and other animals, instead of their thoughtless and injurious destruction, is one of the most

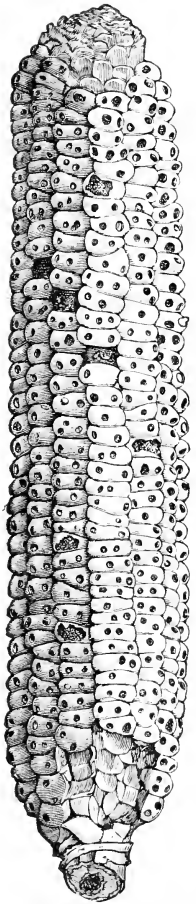

Fig. 13—Ear of pop-corn showing work of Angoumois grain moth. Riley, Report U. S. Dept. Agri.

promising methods of lessening the insect tribes. A single pair of breeding swallows, Bradley has calculated, destroy over three thousand worms in a week. Toads live almost entirely upon insects, and do not injure plants. A large class of insects also live entirely upon insects that are injurious to plants, and should be encouraged.

LIME AND SALT.—Dressing the soil with lime, sowing in autumn six or eight bushels of salt to the acre, turning over the soil and exposing it to frost just before winter, or during the winter months when the ground is open, are all found to be beneficial. Rolling the surface soil smooth when crops are planted destroys the hiding places of many insects, and renders them less destructive.

Any insect peculiarly injurious must be watched as to its habits, mode of feeding, and its transformations, in order to discover where it may be most successfully attacked.

As healthy plants are less subject to attack, keep the ground in good order, sow good seed, cultivate thoroughly, and the crop will be less endangered.

HAND-PICKING.—In some cases, the only effectual mode is hand-picking. If the leaf-roller, the beetle, or the grub is crushed under foot, by preventing reproduction a thousand enemies are destroyed at once.

MICE may be caught in traps, or poisoned with arsenic; but the latter is dangerous if fowls or children have access to the garden.

MOLES are often very troublesome in undermining beds of cuttings or young plants in search of worms and insects. They may be caught in various traps sold for the purpose, but by putting tarred sticks in their burrows they will be driven from them. Salting the soil is fatal to many insects that are the food of the mole.

HARES AND RABBITS are very destructive to trees and garden vegetables in all country places, and even in towns we do not escape; they can be repelled by a tight board fence, or a close hedge of the Macartney rose. Choice trees can be bound up in straw during the winter, or in an envelope of chestnut bark slipped over the stem.

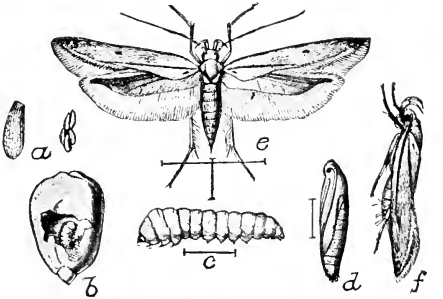

Fig. 14—*Sitotroga cerealella.* *a*, Eggs. *b*, Larva at work. *c*, Larva, side view. *d*, Pupa. *e*, Moth. *f*, Same, side view. Chittenden, Div. Ent. U. S. Dept. Agri. Farmers' Bulletin No. 45.

In the following list will be found some of the most troublesome insects and fungi prevalent in the South. This list is not complete, and the effort has been made simply to give the most common forms of pests; and, therefore, if the reader desires more extended information upon this very important subject he is referred to works devoted to entomology and pathology.

ANGUMOIS MOTH (*Sitotroga cerealella*, Oliv.).—In the adult form of this insect it is a moth one-half inch across

the expansion of the wings. Its body has a shiny appearance, and the wings are fringed with delicate hair-like appendages. This insect is one of the most destructive to stored grain to be found in the South. The larva is about one-fourth of an inch in length, of a light color, and is covered with numerous short hairs. The pupa is somewhat shorter than the caterpillar and of a darker color.

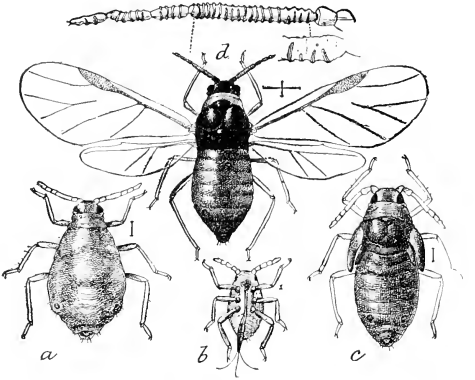

Fig. 15—*Schizoneura lanigera*. *a*, Agamic female. *b*, Larval louse. *c*, Pupa. *d*, Winged female, with antenna enlarged above. All greatly enlarged and with waxy excretion removed. Marlatt, Div. Ent. U. S. Dept. Agri. Cir. 20.

Either before the grain is taken from the field or after it is stored the moth deposits her eggs between the rows of grain on the cob. A few days after these hatch, and the young caterpillars penetrate the grain and feed on the starchy material. Within four or five weeks this larva passes into the pupa state, and several days after it comes forth as a moth. In the far South there are as many as eight broods each year.

REMEDY.—The bins should be made close, and when

the presence of the insect is detected the grain must be fumigated with carbon bisulphide. This is highly inflammable, and fire must not be brought near it while fumigation is going on.

Woolly Aphis, or Apple-tree Blight (*Schizoneura lanigera*), is found upon the apple tree. The female is a small, egg-shaped, dull reddish-brown insect, with a black head, dusted with white powder, and with a tuft of white down growing from the hind part of the back, which makes a colony of these insects look like a small patch of white down. Each tuft contains a female and her young, which last are of a pale color. In Europe, trees are often white with these insects. Here they are generally found at the base of twigs and suckers from the trunk, or where a wound in the bark is healing. Scrape the bark of the tree, if rough, and wash the tree, filling every crevice with kerosene or a solution of two pounds potash to seven quarts of water, or Harris' Composition—two parts soft soap and eight of water, with lime enough to make a thick whitewash. Sulphuric acid, mixed with ten times its bulk of water, is also recommended.

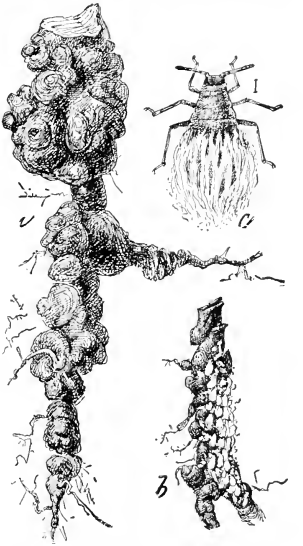

Fig. 16—*Schizoneura lanigera*. *a*, Root of young tree, illustrating deformation. *b*, Section of root with aphides clustered over it. *c*, Root louse; female. *a* and *b*, Natural size; *c*, much enlarged. Marlatt. Div. Ent. U. S. Dept. Agri. Cir. 20.

APPLE ROOT-BLIGHT.—The Woolly Aphis is like the Grape Phylloxera in producing a root form also. The attack of this insect on the roots of the apple make wart-like excrescences, in the crevices of which are contained minute, yellow lice, often accompanied with larger winged ones of a black color, having their bodies covered with white, cotton-like matter. The wounds made upon the root by these insects produce an increased flow of sap

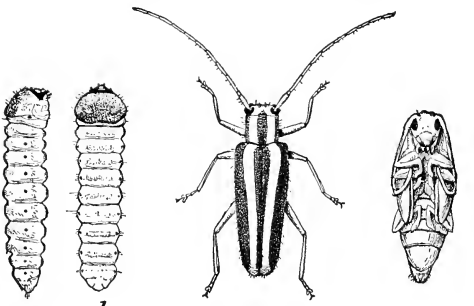

Fig. 17—*Saperda candida*. *a*, Larva from side; *b*, from above. *c*, Female beetle. *d*, Pupa. All enlarged one-third. Chittenden, Div. Ent. U. S. Dept. Agri. Cir. 32.

to the spot affected, and these morbid enlargements are the result. Nursery trees affected should have their roots soaked in soapsuds before planting. Trees affected in the fruit garden may have their roots partly bared, and a liberal application of charcoal dust, ashes, or soapsuds, poured upon the warty excrescences. Their presence gives the affected trees a yellow, unhealthy appearance. The application of carbon bisulphide to the ground around the roots is probably the best remedy known. Tobacco ground fine and placed on the ground and then well wet with water is excellent. But if the tree is

seriously injured by the attack of this insect it will be best to root up the plant and burn it, and use the place for some other plant not susceptible to the attack of the Aphis.

APPLE-TREE BORERS (*Saperda candida; Chrysobothris femorata*, Fab.).—The first insect in its adult form is a beetle, pale brown with two yellow stripes down its back. The borer, or larval stage, is a grub with a large rounded head and sharp jaws. The eggs are deposited near the base of the tree and the grub bores into the bark as soon as hatched, twelve to eighteen days after the eggs are laid. The borer remains in the trunk of the tree about three years, cutting a tortuous channel, sometimes completely girdling the tree and killing it. The latter insect is also a beetle in its parent form, but is somewhat smaller with a greenish-black back and copper color on the under side. The eggs are deposited one at the time in the crevices of the bark on the trunk and larger limbs, and are hatched within two weeks. The grub does not remain in the tree as long as the saperda, not more than two years, and it consequently does not bore as far into the wood.

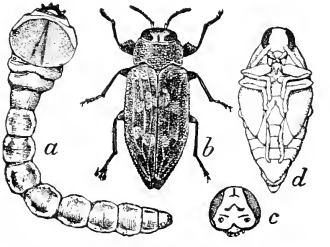

Fig. 18—*Chrysobothris femorata*. *a*, Larva. *b*, Beetle. *c*, Head of male. *d*, Pupa, twice natural size. Chittenden, Div. Ent. U. S. Dept. Agri. Cir. 32.

Plants Injured.—Apple, pear, and quince.

REMEDIES.—The remedy is preventive, because when the insects once reach the interior of the trunk the tree becomes so seriously damaged it will seldom recover. If the grub has just entered and the orifice can be discovered a wire run into the hole will soon end the work

of the enemy. The best preventive is a soap and corrosive sublimate wash made as follows:

Corrosive sublimate,	1 ounce.
Soft soap,	10 gallons.
Alcohol,	1 pint.
Water,	to make a stiff paint.

Dissolve the sublimate in the alcohol and add the soap, and then the water. Apply this wash to the tree early in May, and renew within twenty days, or earlier, as long as the beetles are seen flying about. Coat the trunk and the large limbs.

Apple-Tree Tent Caterpillar (*Clisiocampa Americana*).—The moth is a reddish night-flying insect which lays her eggs, 200 or more, around small twigs in early summer, and then dies. These eggs remain unhatched until the following spring, when the tree begins to bud, when they hatch small caterpillars, which feed upon the leaves of the tree. The caterpillars spin a web in the forks of the tree, where they remain at rest during the hot part of the day. These web tents are quite dense and seldom attain a larger size than one foot.

Plants Injured.—Apple, cherry, and other trees.

Remedies.—Fasten to a long pole a wad of cotton dipped in kerosene oil and burn the webs while the caterpillars are resting therein.

Blister Beetle (*Epicauta rittata*, Fab.).—This insect is also called the "potato bug," but it must not be confused with the Colorado bug. The beetle is yellow, with two black stripes down each wing cover. It is about one-half inch long. The larvae feed on eggs of other insects, and the beetle lives on the leaves of plants.

Plants Injured.—Irish potatoes, beets.

Remedies.—Hand-picking and spraying with Paris green or London purple.

CODLING MOTH; APPLE WORM (*Carpocapsa pomonella*, Linn.).—The adult is a small brown moth, which flies generally at night, and deposits her eggs singly on the surface of young fruit just after the flower falls. When these eggs hatch the young worm cuts its way into the apple, usually at the blossom end, and remains here feeding until full grown, which occurs within a few days. The worm then finds its way out, descends to the ground by a web or otherwise, and passes into the pupa state under the projections of the bark at the base of the tree. In two or three weeks another brood of moths is formed, and other apples are attacked in the same manner. The larvae mature about the time in autumn when the ripe apples are gathered. In the illustration the two lower insects are enemies of

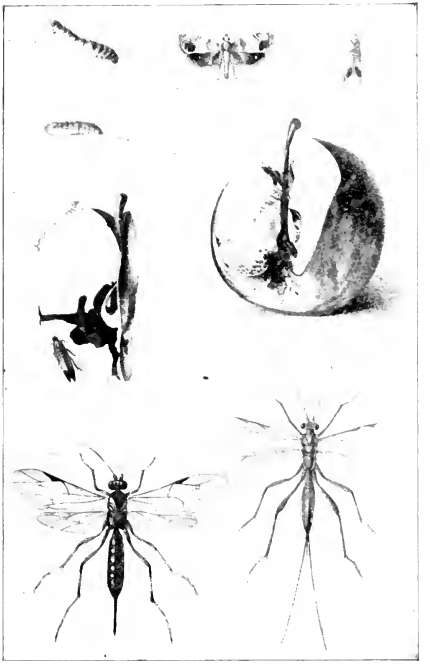

Fig. 19—Codling Moth. *Carpocapsa pomonella.* Div. Entomology U. S. Dept. Agri.

the codling moth and are named *Pimpla annulipes* and *Macrocentrus delicatus*.

Plants Injured.—Apple, pear.

REMEDIES.—All defective fruits which fall to the ground, the loose bark and trash should be cleaned up and burned. Spray with arsenites such as Paris green and London purple. For the formulae see the end of this chapter.

CORN-EAR WORM; BOLL WORM (*Heliothis armigera*, Hbn.).—This is the well-known cotton-boll worm, and the damage it commits in all sections of the South cannot be estimated. The adult is a moth varying in color from yellowish gray to a dark yellow, and on the outer wings is a broad band, dark on the outer margins, with a white spot on the inside. When the wings are spread the insect is from one and a half to two inches from tip to tip. The worm is about one inch long, and it transforms into the pupa below the surface of the ground.

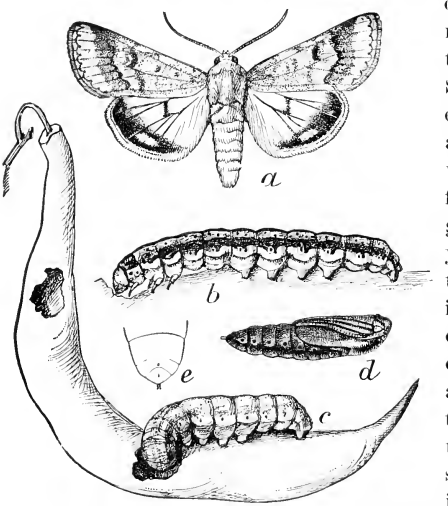

Fig. 20—Boll Worm or Corn-Ear Worm. *Heliothis armigera*. Div. Ent. Dept. Agri.

Plants Injured.—Cotton bolls, corn, tomatoes, squashes, tobacco, peas, beans, and potatoes.

REMEDIES.—Hand-picking and rotation in crops will greatly reduce the number of insects. The use of a solution of hellebore, three ounces to sixteen gallons of hot water, applied without dilution, is also recommended.

CABBAGE WORM (*Pieris rapæ*, Linn.).—This is a foreign insect introduced many years since from Europe. It is well known in all sections of the United States where the cabbage plant is cultivated. The butterfly is light cream color, about two inches across the expansion of the wings. The worm is green with a yellow stripe extending down the back, with small yellow spots on each side. The greatest damage is committed by the worm. It eats the leaves, destroying them completely. There are two broods in the South.

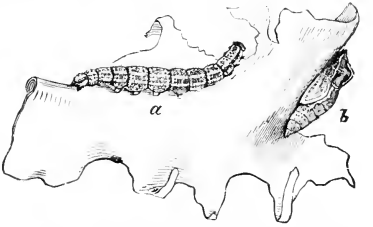

Fig. 21—*Pieris protodice*. *a*, Larva. *b*, Chrysalis. Riley, Div. Ent. U. S. Dept. Agri. Report, 1889.

Plants Injured.—Cabbages.

REMEDIES.—Paris green, one-fourth of a pound to a barrel of water, sprayed on the plants.

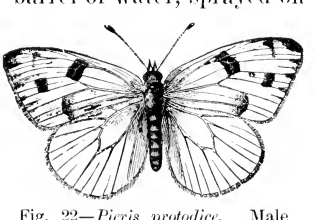

Fig. 22—*Pieris protodice*. Male butterfly. Riley, Div. Ent. U. S. Dept. Agri. Report, 1883.

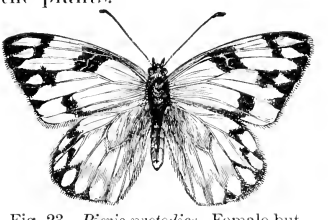

Fig. 23—*Pieris protodice*. Female butterfly. Riley, Div. Ent. U. S. Dept. Agri. Report, 1883.

Pieris protodice and *P. monuste* are two other species of the cabbage worm which are also found in the South

destructive to the plant. They resemble in many respects the first described, differing in coloring and size, and the same remedies are applicable.

CABBAGE LOUSE (*Aphis brassicæ*, Linn.).—A green plant louse, occurring on the under surface of the leaves, and,

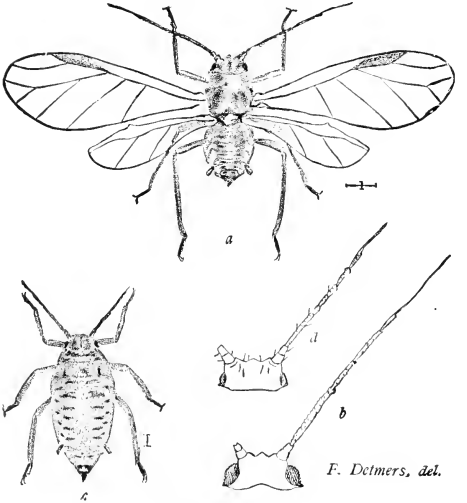

Fig. 24—*Aphis brassicæ*. *a*, Winged male, magnified. *b*, Head and antenna of same, more magnified. *c*, Viviparous female, magnified. *d*, Head and antenna of same, more magnified. Insect Life, Vol. III, Div. Ent. U. S. Dept. Agri.

when in large numbers, seriously injuring the plant by sucking its juices, causing the leaves to wither and die.

Plants Injured.—Cabbage, cauliflower, and similar plants.

REMEDIES.—Pyrethrum powder mixed in water and sprayed on the plants will generally destroy these insects.

Kerosene emulsion diluted to one-half its usual strength and applied with the sprayer is also excellent. Tobacco solution is also recommended, and made as follows: Powdered tobacco three pounds, boiled in ten gallons of water for one hour, applied without dilution.

CABBAGE WORM (*Plusia brassicae*, Riley).—This is one of the common insects injurious to the cabbage and other plants. It is a green worm about one inch long, usually with light stripes down its body; these stripes, however, are sometimes wanting. The worm raises the center of its body in moving over the leaves, and for this reason is called a "looper." The moth flies at night, but may be seen sometimes during cloudy weather flying over the cabbage field. The eggs are greenish yellow, and are deposited on the upper or lower sides of the leaves. This insect eats the leaves, and at times bores into the head of the cabbage. There are about six broods during the season.

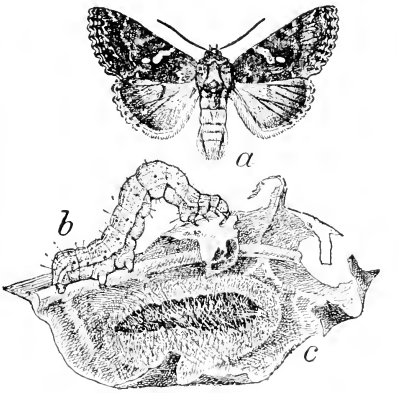

Fig. 25—*Plusia brassicae*. *a*, Moth. *b*, Full grown larva. *c*, Pupa with its cocoon, natural size. Howard, Div. Ent. U. S. Dept. Agri. Year Book, 1898.

Plants Injured.—Cabbage, celery, cauliflower, lettuce, turnips, tomatoes.

REMEDIES.—Paris green or London purple will kill the plusia, but these poisons must not be used after the cab-

bage begins to head. The kerosene emulsion is the safest remedy.

Soft soap,	1 pound.
Kerosene oil,	1 pint.
Water,	2 quarts.

Boil the water and soap solution, remove from the fire and add the kerosene. Churn the solution until the ingredients are thoroughly mixed, and the oil then will not separate after cooling. Dilute with its bulk of water, and spray with a force pump so as to strike the insects firmly.

CUT WORMS (*Peridromia saucia; Mamestra trifolii*).—There are several genera of these destructive insects

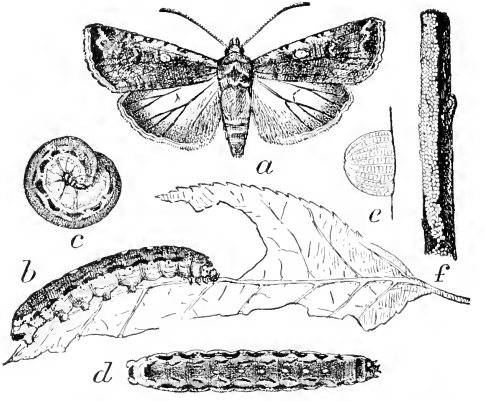

Fig. 26—*Peridromia saucia*. *a*, Adult. *b*, *c*, *d*, Full grown larvae. *e*, *f*, Eggs. All natural size except *e*, which is greatly enlarged. Howard, Div. Ent. U. S. Dept. Agri. Year Book, 1898.

found distributed throughout the United States, and the larvae, or worms, are recognized by the cylindrical, naked form, marked with longitudinal stripes, and, when disturbed, the worms curl up and remain quite motionless

for a short while. The adults are moths, rather small and of an ashy hue. The eggs are laid on stems of low plants in late spring, and, when the worms hatch, they descend into the ground. When winter approaches they find refuge under logs or other objects. The warmth of the following spring brings them forth, and they at once begin feeding on the tender plants within reach. In a few weeks they transform into the pupa state and then into the moth.

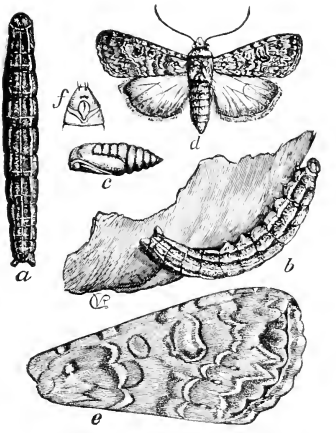

Fig. 27—*Mamestra trifolii*. *a*, *b*, Larva. *c*, Pupa. *d*, Moth. *e*, Wing of same. *f*, Anal segments of pupa. Riley, Div. Ent. U. S. Dept. Agri. Report, 1883.

Plants Injured.—Nearly all varieties of vegetables.

Remedies.—Dr. Riley recommends the distribution of poisoned leaves over the surface of the ground before setting out the plants, and repeating this operation. The leaves are to be poisoned with Paris green or London purple. In the use of these poisons, however, chickens and other domestic animals must not be allowed to eat the leaves, because death will result. Hand-picking while the worms are feeding, or digging for them, is effective.

Cucumber Beetle (*Diabrotica vittata*, Fab.).—This insect causes great trouble to the gardener, because it makes its attacks when the plants are quite young, by eating holes in the leaves and causing the entire plant to

wither and die. The beetle is small, about one-sixth of an inch in length, yellow in color with a black head and three stripes running down its back. The grubs also cause considerable damage to the roots of plants.

Plants Injured.—Cucumbers, melons, squashes.

REMEDIES.—Application of dry Paris green to the leaves of the plant. Kerosene emulsion has also been successfully used. The cucumbers and melons, when planted on a small scale, may be protected until large enough to resist the attacks of the insect, by covering them with mosquito netting. Use of tobacco and dusting the plant with pyrethrum have also been recommended.

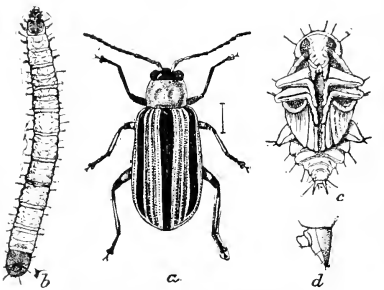

Fig. 28—*Diabrotica vittata. a*, Beetle. *b*, Larva. *c*, Pupa. *d*, Side view of anal segment. Chittenden, Div. Ent. U. S. Dept. Agri. Cir. 31.

COLORADO POTATO BEETLE (*Doryphora decemlineata*, Say).—This is a common enemy to the Irish potato, and is easily recognized by the bright striped condition of its body. It is small, and oval in shape. It is a voracious insect, and eats the entire plant.

Plants Injured.—Irish potatoes and its kind.

REMEDIES.—Application of Paris green or London purple, either in the dry state or sprayed on the plants.

CANKER WORM (*Anisopteryx pometaria*, Harr, or fall canker worm; *Paleacrita vernata*, Peck, or spring canker worm).—The two species of this insect are strikingly alike, and, to the unpracticed eye, they may be readily

termed one and the same insect. The worms are generally called "measuring worms," because of the peculiar bending of the body in moving from place to place. The eggs are deposited in late fall by a wingless insect somewhat resembling a spider. The worms are green-brown in color, and they feed on the leaves and flowers.

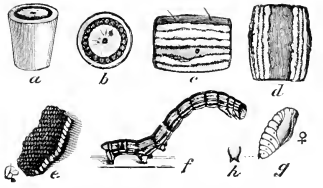

Fig. 29—*Anisopteryx pometaria*. *a*, *b*, Egg. *c*, *d*, Dorsal and side views of larval segment, enlarged. *e*, Egg-mass. *f*, Larva. *g*, Female pupa, natural size. *h*, Anal tubercle, enlarged. Riley, Div. Ent. U. S. Dept. Cir. 9.

Plants Injured.—Apple, plum, cherry, elm.

REMEDIES.—Spraying with Bordeaux mixture, to which Paris green has been added. This application must not be made while the blossoms are opening, because the tender parts of the flower will be injured by the Bordeaux mixture.

GRAPE VINE FIDIA (*Fidia viticida*, Walsh).—A beetle about one-quarter of an inch long, of a brown color and covered with dense light yellow hairs. It attacks the grape leaves by eating irregular holes in them. When the insect is disturbed it falls to the ground and feigns death. The eggs are laid in the cracks of the bark some distance above the ground. The larvae, when hatched, fall to the ground and bore into the earth to feed on the tender roots of the vine. They remain below the surface feeding on the roots and in the pupa state until the fol-

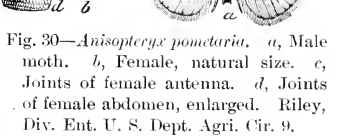

Fig. 30—*Anisopteryx pometaria*. *a*, Male moth. *b*, Female, natural size. *c*, Joints of female antenna. *d*, Joints of female abdomen, enlarged. Riley, Div. Ent. U. S. Dept. Agri. Cir. 9.

lowing June, when the beetles emerge to destroy the foliage.

REMEDY.—Spraying with arsenical compounds (arsenic and lime used in the strength of one pound to 150 gallons of water) will destroy the beetle. This spraying must be done early, so as to avoid the danger to the fruit. The

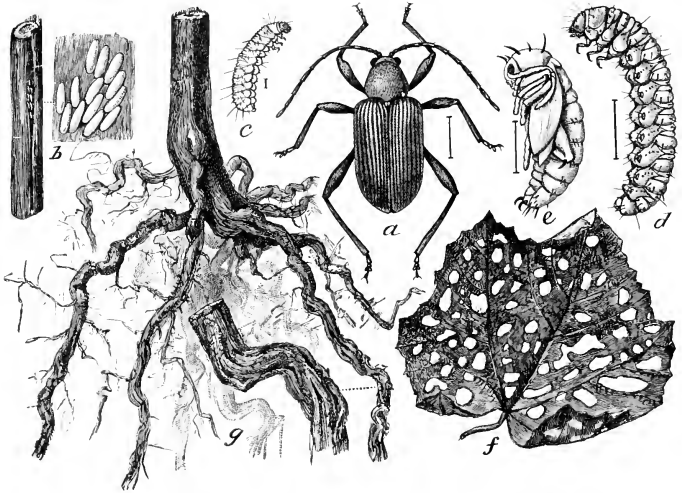

Fig. 31—*Fidia viticida*. *a*, Beetle. *b*, Eggs represented natural size under fold of bark, and much enlarged at side. *c*, Young larva. *d*, Full grown larva. *e*, Pupa. *f*, Injury to leaf by beetles. *g*, Injury to roots by larvae. *b*, In part, and *f* and *g* natural size, rest much enlarged. Marlatt, Div. Ent. U. S. Dept. Agri. Year Book, 1895.

larvae may be destroyed by injecting carbon bisulphide into the ground, or by wetting the soil with a kerosene emulsion diluted nine times. A gallon of this solution is poured in a hole around the vine, and an hour later washed down to greater depths.

GRAPE LEAF FOLDER (*Desmia maculalis*, Westw.).—"One of the noticeable features of a vineyard, particularly in midsummer and later, is the many folded leaves, the interiors of which have been skeletonized. This is especially evident with thick-leaved varieties, the whitish under surface contrasting strongly with the thick green of the upper. If the leaf be unfolded, it will be found to contain a very active, wriggling, greenish larva, a little less than an inch long, which is apt to spring out of the fold and fall, or hang by a thread. The leaf itself will be found to be attached to the folded part by means of numerous little cords of silk. If the larva is full grown, the interior of the leaf will be thoroughly skeletonized and soiled with accumulated excrements. The fold almost invariably brings the upper sides of the leaf together, the larva feeding, therefore, on what would be the upper surface of the leaf. The larva transforms to a reddish-brown chrysalis usually within a much smaller fold of the edge of the leaf, but sometimes within the larger larval fold. The moth, which, during the summer, issues in a few days, expands about an inch, and is a shining opalescent black, with wings bordered with white and marked with white spots, as in the illustration, a slight variation being noted between the males and

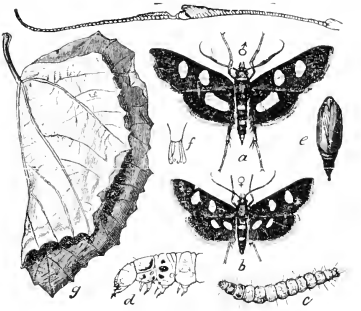

Fig. 32—*Desmia maculalis*. *a*, Male moth. *b*, Female. *c*, Larva. *d*, Head and thoracic segments of same, enlarged. *e*, Pupa. *f*, Tip of pupa, enlarged. *g*, Grape leaf folded by larva. Marlatt, Div. Ent. U. S. Dept. Agri. Year Book, 1895.

females. There are two (or in the South, three) broods each summer, the last brood hibernating in the leaves." (Marlatt.)

REMEDIES.—Crushing the insect in the folds of the leaves early in the season is the sure way to get rid of the trouble. If this method is pursued systematically each day the task is not difficult, because the folded leaves are readily detected, and the remedy is certainly effectual.

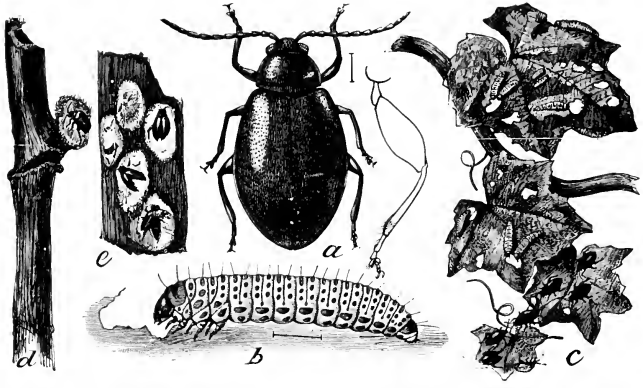

Fig. 33—*Haltica chalybea*. *a*, Beetle. *b*, Larva. *c*, Larvae and beetle on foliage. *d*, Injury to buds. *e*, Beetles killed by fungus. *a* and *b*, Much enlarged, rest natural size. Marlatt, Div. Ent. U. S. Dept. Agri. Year Book, 1895.

Burn all of the rubbish in the fall found on the ground around the vines, and in this way many larvae will be destroyed, which will otherwise pass through the winter in these protected places and come forth at the opening of spring to renew the attack on the plants.

GRAPE VINE FLEA BEETLE (*Haltica chalybea*, Ill).—This beetle appears on the grape vine very early in the season and feeds on the young branch buds, thus greatly retarding the growth of the vine. Sometimes when the insects are in great numbers the vine is killed to the roots.

The beetle is of a shining, bluish-green color, one-fifth of an inch long and active in its movements. The eggs are deposited on the under sides of the leaves and hatch within a few days a number of brown larvae, which feed on the upper surfaces of the leaves, cutting small round holes. These larvae feed until the first of June, when they descend into the earth and transform into beetles about the first of July. These feed on the leaves until fall, when they seek protected places, where they pass the winter.

Plants Attacked.—Virginia creeper, alder, plum trees, grape vines.

REMEDIES.—Remove and burn all leaves and rubbish under the vines in the fall. In the spring spray the canes and the young foliage with a solution of Paris green (one pound to 150 gallons of water). Early in the spring the beetles are rather sluggish, and they may be shaken on to cloths which are saturated with kerosene. They will die as soon as they come in contact with the kerosene.

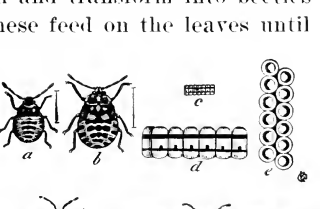

Fig. 34—*Murgantia histrionica*. *a*, Young. *b*, Half grown. *c*, Egg cluster. *d*, Same, from side. *e*, Same, from above. *f*, Adult, wings closed. *g*, Same, wings open. *c*, *f*, *g*, natural size; *a*, *b*, slightly enlarged; *d*, *e*, considerably enlarged. Howard, Div. Ent. U. S. Dept. Agri Cir. 10.

HARLEQUIN CABBAGE BUG (*Murgantia histrionica*, Hahn).—This insect is also known in some sections of the South as the "Lincoln bug." The full-grown insect is striped with orange and black; it is about one-half inch long, of an oval, flattened form. The eggs are laid and hatched within two or three days, and the bugs at once

begin extracting the juices from the plant and continue to do so throughout their entire life.

Plants Injured.—Cabbage, mustard, turnips, rutabaga, radish.

Remedies.—The only sure remedy is hand-picking in the early spring, when the first bugs are noticed. Radish and rutabaga seed might be sown to serve as catch plants, and as soon as the bugs are detected on these plants vigorous spraying with kerosene emulsion and hand-picking will soon greatly reduce the pest. The ordinary application of Paris green frequently fails to kill them, because they live by sucking the juices and not eating the leaves, hence the poisons do not enter their bodies when sprayed on the surfaces of the plants.

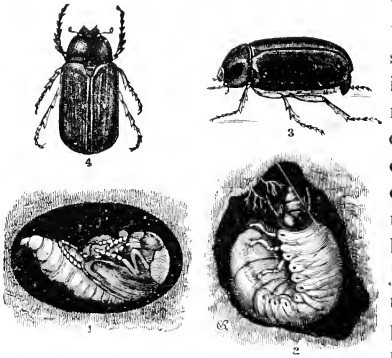

Fig. 35—June Bug. *Lachnosterna fusca*. Riley, Div. Ent. U. S. Dept. Agri.

June Beetle; White Grub (*Lachnosterna fusca*, Riley). The beetles fly about during the months of May and June feeding on young and tender twigs of fruit trees. The work of destruction is done at night. This beetle is well known to children, who delight in catching and imprisoning it with a string to hear its buzzing sound. The eggs are laid about the roots of grass and, when hatched, the grubs feed on the roots of young plants for three years before they come forth in the winged state.

Plants Injured.—Peach, cherry, fig, strawberry.

Remedies.—Fall plowing to bring the grubs to the sur-

face and expose them to fowls and cold weather. Hand-picking in the evening and early morning when the beetle makes its appearance on the trees. A vessel containing kerosene is held under the limbs and the beetles are shaken into it.

LEAF-FOOTED PLANT LOUSE (*Leptoglossus phyllopus*, Linn.).—This has become a very common insect in the South, and it commits its damage by sucking the juices from plants and fruits. It is well recognized by the chocolate color of the body and leaf-like form of the shanks. The eggs are deposited along the ribs of the leaves. It is found in most portions of the Gulf region.

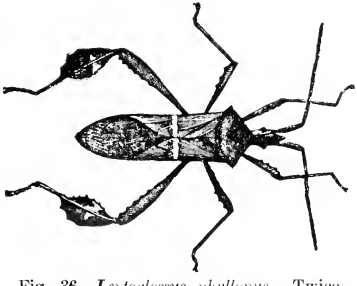

Fig. 36—*Leptoglossus phyllopus*. Twice natural size. Chittenden, Div. Ent. U. S. Dept. Agri. Bulletin No. 19.

Plants Injured.—Cucurbits, sweet potatoes, watermelons, pecan trees, pear, peach, strawberry, Irish potatoes, orange (first came into prominence in the South as a pest on the orange trees*).

REMEDIES.—Hand-picking is the certain remedy, but many of the younger forms can be destroyed by a free and frequent use of kerosene emulsion.

MELON LOUSE (*Aphis gossypii*, Glover).—This insect is called "cotton louse," or "orange aphis." There are three forms found on the plants—viz.: (1) the "nymph," or the recently hatched lice, which are very small and of a greenish-yellow color; (2) wingless females, yellow in

* F. H. Chittenden in Bulletin 19, n. s., U. S. Dept. Agri., Div. Ent.

color; (3) winged females, quite small, ovate with transparent wings containing yellow veins.

Plants Injured.—Red clover, orange, melon, purslane, morning-glory, cotton, pear, dwarf bean.

REMEDIES.—Spraying with kerosene emulsion and pyrethrum.

MELON WORM; MELON BORER (*Margaronia hyalinata*, Linn.).—These worms bore into the melon and eat long, irregular holes, causing the rind to sour and decay. The eggs are laid on the vines early in the season by a moth with white transparent wings containing black borders. The first brood hatched feeds on the vines and leaves, while the second and following broods destroy the fruit.

Fig. 37—*Margaronia hyalinata*. Larva. Cocoons and adults. Comstock, Div. Ent. U. S. Dept. Agri.

Plants Injured.—Melons, cucumbers.

REMEDIES.

Spraying of Paris green during the time the first brood is eating. After the worms enter the fruit, poisoning will not avail, and it will become necessary to destroy the fruit infested.

THE PEACH-TREE BORER (*Sanninia exitiosa*).—The moth comes abroad from midsummer until October. Its body

is of steel-blue color, with an orange band around the middle of the abdomen of the female. Her wings are blue, while those of the male are clear and glossy. The eggs are deposited the latter part of summer, at the base of the trunk, on the soft bark; when hatched they bore their way under the bark, sometimes proceeding upwards along the trunk, at other times downward into the root. Its presence is made known in spring by the effusion of gum; as it does not penetrate the wood, it is easily traced by its holes under the bark. The worm is soft, white, with

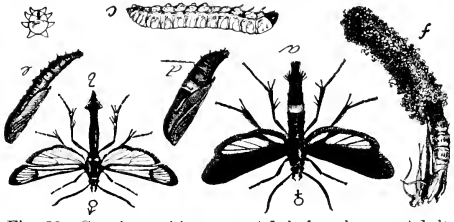

Fig. 38—*Sannina exitiosa*. *a*, Adult female. *b*, Adult male. *c*, Full grown larva. *d*, Female pupa. *e*, Male pupa. *f*, Pupa skin extruded partially from cocoon. All natural size. Marlatt, Div. Ent. U. S. Dept. Agri. Cir. 17.

a tawny, yellowish-red head, and sixteen feet, growing to over half an inch in length. It forms a tough, pod-like cocoon on the side of the root, jutting just above the surface. Remedies are various. Haul the earth from the collar of the tree, clean away the gum, and cut out the grub with a knife and kill it; or pour scalding water into his haunts from the spout of a tea-kettle, which will kill the grub and benefit the tree; leave the basin about the root of the tree open, and re-examine a few days later, as some of the worms may have escaped. Where the mercury does not usually sink below 8° during the winter, it is best to leave the collar of the tree uncovered

and exposed to the action of frost during winter. In spring a small mound of ashes, or slaked lime, or even earth, should be placed about the base of the trunk, which will render the borer less likely to attack the tree. This should be removed or spread out around the tree in autumn. The trees should be closely examined in autumn and spring. There are also certain washes recommended to prevent the insect from entering the tree. Two may be mentioned. The first is very poisonous, and must be used with great care:

1—Soft soap,	10 gallons.
Corrosive sublimate,	1¼ ounces.
Alcohol,	1 pint.

Dissolve the sublimate in the alcohol and add the soap.

2—Sour or buttermilk,	10 gallons.
Hydraulic cement,	10 pounds.

These washes must be put on with a brush, repeating every two weeks until after the moth disappears. Apply the solution from below the ground to several feet above.

THE ONION-FLY (*Phorbia ceparum*, Meiger) is a native of Europe, of late years becoming common in many American gardens, and wherever found is very destructive to the crop. The parent insect is a small ash gray fly, about half the size of the common house-fly. The female lays her eggs on the leaves, when they are very young, close to the earth. As soon as the maggots hatch, which is when the young plants are about the size of a quill, they descend between the coats of the onion to its base, feeding upon the bottom part of the bulb, which soon becomes rotten, when the worm leaves it, to enter the earth and complete its transformations. Figure 39 represents the larva of the natural size at *a* and at *b*, magnified several times. Figure 40 shows the way in which the insects work upon the young plant. In Figure 41 the perfect

insect is given, the natural size of which is indicated by the cross lines, and in the same figure the magnified pupa or chrysalis is shown at *d*, and the actual size at *c*.

REMEDIES.—These insects increase so rapidly that unless destroyed at their first appearance, which is shown by the leaves drooping and turning yellow, it is almost impossible to eradicate them. Such plants should be at once pulled up, and with the soil in which they grew, burned, which will prevent their increase. Applications of soot or salt upon the beds, of lime water, stale urine,

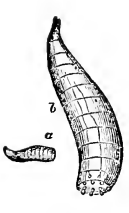

Fig. 39.

Fig. 40.

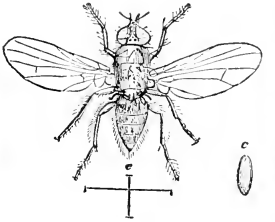

Fig. 41.

and tobacco water, are also employed, and beds strewn with fine charcoal are said to be less liable to attack. It is difficult, however, to reach the insect, except by pulling up the bulb. It is said that removing the earth from the onion bulbs as soon as growth has well commenced will prevent the fly from depositing its eggs, and the onion, being nourished by its fibrous roots, ripens and keeps better.

Professor Slingerland, entomologist of the Cornell Station, New York, recommends spraying with the following: Dissolve one pound soap in half gallon water and emulsify with one pint of crude carbolic acid. Spray freely over the plants as soon as above the ground and every few days after.

THE CURCULIO, OR PLUM WEEVIL, (*Conotrachelus Nenuphar*, Herbst), is a short, thick, rough beetle, of a dark-brown or blackish color, varied with spots of white and

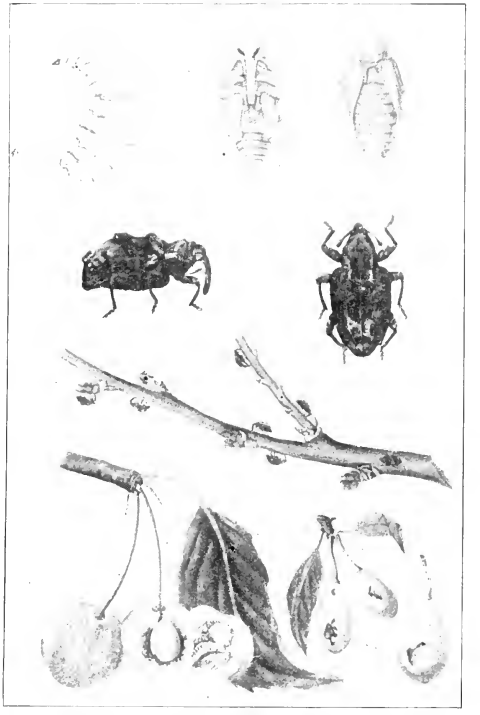

Fig. 42—Curculio or Plum Weevil. *Conotrachelus nenuphar, Her.* Riley, Div. Ent. U. S. Dept. Agri. Report 1888.

yellow; with a long snout hanging down in front like an elephant's trunk. It makes a small, crescent-like incision upon the side of the plum and cherry, just after they are

set, in which it drops an egg. From this is hatched a small, white, footless worm, which bores into the fruit, causing it to drop prematurely from the tree. The worm enters the ground, and in three or four weeks comes out, and the successive broods attack the plum, apricot, cherry, nectarine, and peach, until the fruit ripens. Their incisions have been found in the limbs of the pear tree. The beetle, if discovered, feigns death, and can hardly be distinguished from the dried flower buds by careless observers. Picking or sweeping up the fruit as fast as it drops, and boiling it for pigs, before the worm can enter the earth has been found beneficial; likewise jarring the tree (by striking sharply with a mallet on the stump of a limb removed for the purpose) as soon as the fruit is the size of a pea, and collecting the insects on a white sheet as they fall, and destroying them. As the insects are torpid in the morning, that is the best time for the operation, which should be kept up until the fruit begins to ripen. Plant all stone fruits in an enclosure by themselves in which pigs and poultry are admitted; these will collect the fruit as fast as it falls, and tread the ground firmly together, so that it is not easy for the insects to enter it. None of these methods will be fully effectual if there are neglected trees near by from which the insect may emigrate. The most *reliable* of them is jarring the trees, and destroying the insects daily; the next is giving access to a large flock of ducks and chickens, which, destroying the perfect insect, are a much more efficient remedy than the pigs alone.

THE SQUASH-VINE BORER (*Melittia satyriniformis*, Hbn.).—This insect feeds on the interior of the stem of the squash, and its presence is not detected until it has been in the stem some time, and has grown to a well-developed larva. The leaves of the plant show the damage being done by the insect by wilting, and the

entire plant will soon die unless the insects are destroyed. The adult insect is a moth which flies during the heat of the day, and toward the close of day it lights on the leaves in a rather sluggish condition. The eggs are laid on all parts of the plant, and they hatch from six to fifteen days after being deposited. The caterpillars are small, white, with a dark head and a few scattered hairs over

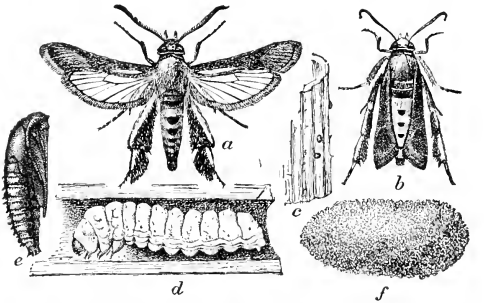

Fig. 43—*Melittia satyriniformis.* *a*, Male moth. *b*, Female when at rest. *c*, Eggs shown on bit of squash stem; *d*, Full grown larva in vine. *e*, Pupa. *f*, Pupa cell. All one-third larger than natural size. Div. Ent. Dept. Agri. Cir. 38.

the body. When full grown they measure about one inch in length.

Plants Attacked.—Squashes, pumpkins, gourds, muskmelons, cucumbers.

REMEDIES.—Because the caterpillar is found in the stem it is very difficult to treat it with spraying methods, so we are compelled to resort to cutting the insect out of the stem and to use preventive means. Rotation of crops will serve to check the trouble; also planting trap crops and burning these when the eggs are deposited on them. Fall harrowing and deep spring harrowing have also been found beneficial in exposing the pupae or cocoons

to the cold air and the birds or fowls. This followed by deep plowing will prevent other cocoons that may escape from reaching the surface in the form of the moths. Burn all dead vines and squash rubbish after the squashes are gathered. During the growing season keep the plants vigorous and healthy. (Chittenden.)

THE SQUASH BUG (*Anasa tristis*, DeG.).—This insect is of a rusty black color above, and yellowish beneath; of a foul, disgusting smell; of quick motions. It eats the leaf and stem, and at length destroys the stem. It lays its dark-colored eggs in patches upon the under surface of the leaf, to which they adhere strongly. As soon as hatched, the young enemy in little swarms commence feeding upon the leaf, upon its under side, which soon withers. They are quite timid, but may be found in the cool of the day concealed under the leaves or clods of earth, and should be sought for while the vines are young, daily, in the morning, and crushed before they become numerous.

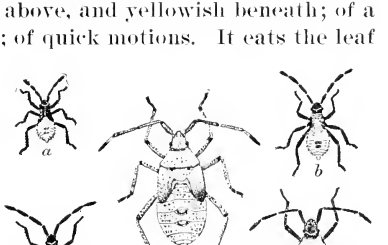

Fig. 44.—*Anasa tristis* nymphs. *a*, Newly hatched. *b*, Second stage. *c*, Third stage. *d*, Fourth stage. *e*, Fifth stage. All about twice natural size. Chittenden, Div. Ent. U. S. Dept. Agri. Cir. 39.

THE TURNIP FLEA BEETLE (*Phyllotreta vittata*, Fab.).—This is a small, hard-shelled insect, of a smooth, shining, brassy, or greenish-black color, about an eighth of an inch in length. There are two yellow stripes down the wing cases. The hinder legs are formed for leaping. It attacks the turnip, and other plants of the same family,

both in its perfect and larva states. When the plants have attained some size the injury to the crop is slight, but they generally take the young plants while in the seed leaf, and destroy the crop entirely in a few hours, whether it be a small bed, or a large field.

The best remedies are preventive, such as to roll the surface smoothly, so that the insects may find no hiding places in the soil, to sow the seed in drills, and in a fine, rich soil, and apply superphosphate of lime upon the seed in the drills, to apply plenty of seed, and thin out the plants when in the rough leaf. Anything that will accelerate growth will soon place the crop out of danger from these little insects. Some sow radish seed with turnips, as the flea prefers the young radish leaf. If they once attack the plants, dusting them with lime ashes and soot is sometimes useful, but when in great numbers, it is scarcely possible to save the young crop. Kerosene emulsion should be sprayed around the roots and stems to destroy eggs and larvae.

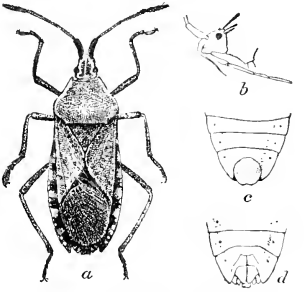

Fig. 45—*Anasa tristis*. *a*, Mature female. *b*, Side view of head. *c*, abdominal segments of male. *d*, same of female. *a*, Twice natural size; *b*, *c*, *d*, slightly more enlarged. Chittenden, Div. Ent. U. S. Dept. Agri. Cir. 39.

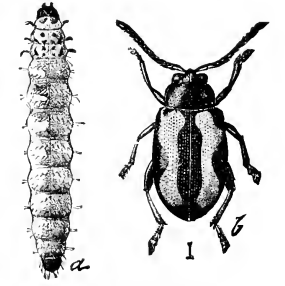

Fig. 46—*Phyllotreta vittata*. *a*, Larva. *b*, Adult. Both greatly enlarged. Riley, Div. Ent. U. S. Dept. Agri. Report, 1884.

THE OYSTER-SHELL BARK LOUSE (*Mytilaspis Pomorum*, Bouche).—This is probably the commonest and most widespread, and consequently the best known, of any of the orchard scales. It is found all over the world. It is found in the United States practically wherever apples

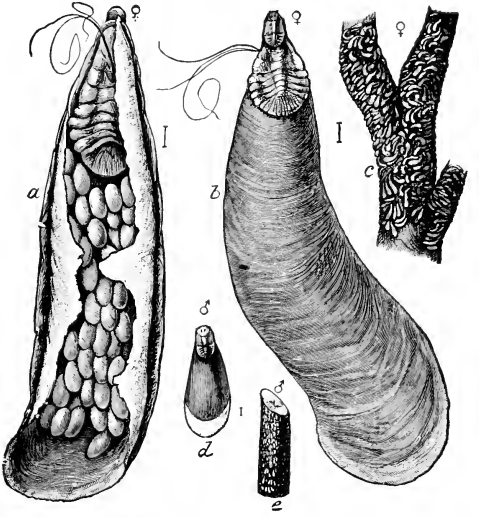

Fig. 47—*Mytilaspis pomorum*. *a*, Female scale from below, showing eggs. *b*, Same from above, greatly enlarged. *c*, Female scales. *d*, Male scale, enlarged. *e*, Male scale on twig, natural size. Howard, Div. Ent. U. S. Dept. Agri.

and pears are grown. If, during the winter, one of the female scales be lifted, it will be found to contain the shriveled body of the dead female, under the anterior or more pointed portion, while behind this the yellowish-white eggs are thickly massed together back to the extremity of the scale. Under each scale the eggs number from forty-two to eighty-six. The young hatch from these

eggs in spring, wander out upon the twigs, and settle at once. With this species the young twigs are generally the only parts of the tree seriously affected. Older twigs, however, are also attacked, and many specimens of the insect may be found upon the trunk. There is generally only one brood in most sections of the country, although in the far South there may be two broods occurring in each year. After inserting its beak and settling, the female molts twice, and begins the formation of the scale, which is secreted mainly from the hinder portions of the body and extends backward, the two cast skins remaining in an overlapping position on the anterior portion of the scale. The male scale is much smaller than the female scale, as indicated in the figure, and is otherwise distinguished by a few structural peculiarities. In the first place, there is but one cast skin at its anterior extremity, and in the next place, the hinder portion of the scale is hinged in such a way that it lifts up like a flap, permitting the escape of the adult male. (Howard.)

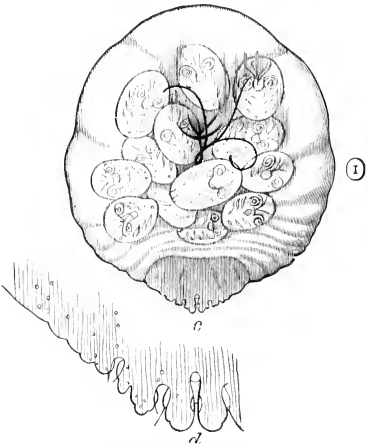

Fig. 48—*Aspidiotus perniciosus*. *c*, Adult female removed from scale, showing embryonic young, greatly enlarged. *d*, Anal plate, still more enlarged. Howard. Div. Ent. U. S. Dept. Agri.

Plants Attacked.—Apple, pear, plum, quince, raspberry, currant, maple, ash, elm and other forest trees.

Besides the San Jose scale and the oyster-shell bark louse there are other scales which are destructive to fruit and other trees in the South. Among the number may be mentioned the scurfy bark louse (*Chionaspis furfurus*, Fitch); the greedy scale (*Aspidiotus camelliae*, Sign.); the English walnut scale (*Aspidiotus juglans-regiae*, Comst.); the new peach scale (*Diaspis lanatus*, Morgan & Cock.).

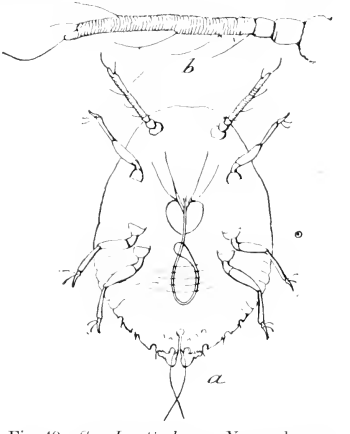

Fig. 49—*San Jose Scale*. *a*, Young larva, greatly enlarged. *b*, Antenna of same, still more enlarged. Howard, Div. Ent. Cir. 3, U. S. Dept. Agri.

REMEDIES.—Two of our common orchard scales, viz., the scurfy bark louse and the oyster-shell bark louse, hibernate in the egg state, and their hatching is comparatively uniform. The approximate date throughout the middle belt of the country is from the middle to the end of May. Moreover, the larvae are comparatively slow to settle, and the scale at first is not very dense. Therefore, one, or, at the most, two applications of kerosene-soap emulsion, diluted with ten parts of water, made about the first of June, will hold these two species well in check. (Howard.)

SAN JOSE SCALE (*Aspidiotus perniciosus*, Comst.).—This is one of the most destructive insects which attack the apple. It is becoming very widely spread throughout the United States, and when it finds lodgement in an orchard heroic measures are required to eradicate the pest. Great

care should be exercised when purchasing trees to buy only from those nurserymen who are known to be reliable, and who are provided with satisfactory bills of health signed by well-known entomologists.

Messrs. Howard and Marlett, of the Division of Entomology of the United States Department of Agriculture, have made extensive experiments with the various methods recommended for the destruction of this insect, and their studies concerning the life history of the scale

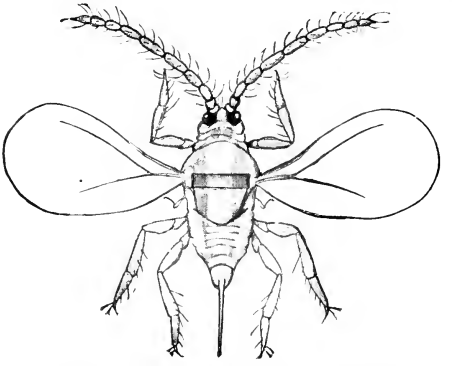

Fig. 50—San José Scale. Male adult, greatly enlarged. Howard, Div. Ent. U. S. Dept. Agri. Cir. 3.

have been so full and complete the summary made by them is given. The illustrations are also taken from the publications of these entomologists:

"The scale is not readily detected by the casual observer, and consequently often remains unnoticed until the death of the tree calls attention to it. Unfortunately, it multiplies rapidly. Each adult female continues to give birth to living young for a long period (six weeks), and there are several (probably four) generations each year. It infests the stems, twigs, leaves, fruit of nearly all deciduous trees, and is extremely difficult to kill. The

young insects are almost microscopic in size, being one-hundredth of an inch in length, consequently not seen except by the practiced eye. The mature insects, as already indicated, are very small and without some experience will be readily overlooked, even by good observers. Also, persons uninformed might easily mistake other insects for this species. The most common scale upon orchard trees is the 'scurfy bark louse' (*Chionaspis furfurus*), but this differs from the San Jose scale in some important particulars. First, the scurfy scale is elongate, never circular in outline; lies flat upon the bark, and is papery white in color; second, this scale passes the winter in the egg state and is single brooded, while, on the contrary, the San Jose Scale passes the winter in all stages, from the minute egg, just covered with the scale, up to mature individuals."*

Fig. 51—San José Scale. Apple branch, with scale in situ, natural size. Enlarged scales above at left. Howard, Div. Ent. U. S. Dept. Agri. Cir. 3.

Plants Injured.—Almond, apricot, acacia, alder, cherry, currant, gooseberry, hawthorn, linden, osage orange, pear, peach, plum, persimmon, pecan, quince, raspberry, rose, spirea, weeping willow.

REMEDIES.—"(1.) In all cases of recent or slight attack the affected stock should be promptly uprooted and burned. No measure is so sure as this, and the danger of spread is so great that this course seems fully warranted.

*Circular No. 42, Div. Ent., U. S. Dept. Agri.

"(2.) In cases of long standing and wide extent the affected stock should be cut back severely and treated with winter soap wash; stock badly incrusted with scale should be cut out at once and burned. The lessening of the vitality, together with the poisoning of the sap-wood already affected by the scale in such cases, will usually prevent the plant from ever again becoming healthy, and generally it is beyond help. We wish particularly to impress upon the minds of fruit growers that as soon as this insect is found to occur in an orchard the most strenuous measures must be taken to stamp it out. No half-way steps will suffice. The individual must remember that not only are his own interests vitally at stake, but those of the entire community in which he resides. He may think that he cannot bear the loss, but the loss in consequence of the slightest neglect will be much greater. The fact, too, that there is a community of interests among fruit growers in this matter must not be lost sight of. Fruit growers must be mutually helpful in an emergency like this.

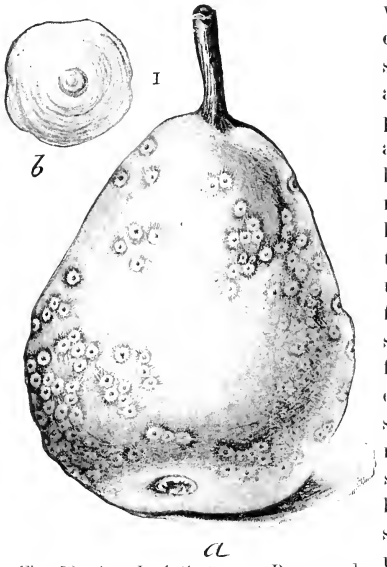

Fig. 52—San José Scale. *a*, Pear, moderately infested, natural size. *b*, Female scale, enlarged. Howard, Div. Ent. U. S. Dept. Agri. Cir. 3.

"(3.) As precautionary measures to prevent the introduction of the scale into new districts, the following considerations are important: No orchardist should admit a single young fruit tree or a single cutting from a distance into his orchard without first carefully examining it and

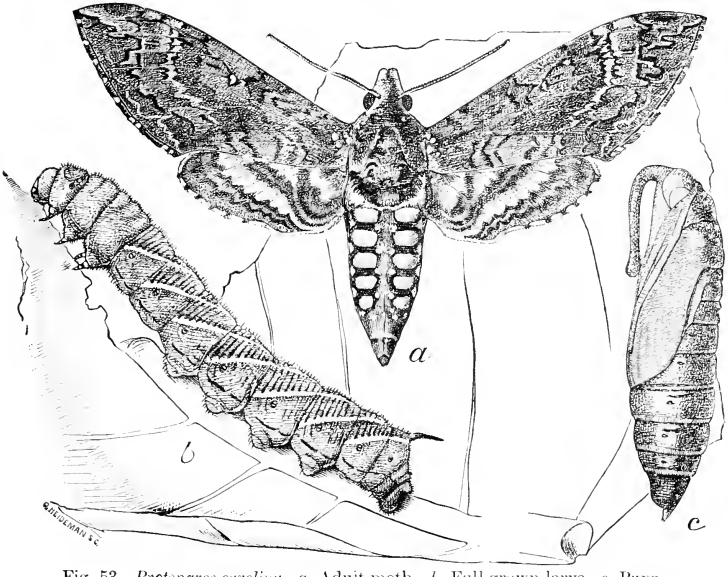

Fig. 53—*Protoparce carolina*. *a*, Adult moth. *b*, Full grown larva. *c*, Pupa, natural size. Howard, Div. Ent. U. S. Dept. Agri. Year Book, 1898.

satisfying himself conclusively that it does not carry a single specimen of the San Jose scale; he should insist, also, on a guaranty from the nurseryman of such freedom. In addition, no fruit should be brought upon the premises without previous careful inspection. If this course is adopted by every one interested, without exception, the rate of spread of the species may be limited to

the comparatively slight natural extension by crawling, by winds, and by the aid of other insects and birds."*

TOBACCO WORM, OR TOMATO WORM, OR HORN WORM (*Protoparce carolina*, Linn., and *P. celeus*, Hubn.).—"There are two species of large sphinx moths whose larvae, or caterpillars, eat the leaves of tobacco, tomato and allied plants, including, occasionally, the Irish potato. These caterpillars, from the fact that each bears upon one of the posterior segments of the body a rather stout, curved horn, have become popularly known as horn worms. Tobacco growers do not distinguish between the two different kinds of horn worms, and for practical purposes it is not in the least necessary that they should distinguish them. The curious brown pupa into which the caterpillar transforms, which is found under the surface of the ground, and which is at once recognized by the handle-shaped process which issues from the top of the head, is the form from which issues the adult moths. Both of the insects occur more or less abundantly in the tobacco fields over the entire tobacco-growing regions of the United States. In certain localities one species will be much more abundant than the other, and in other localities the numbers will be more evenly divided. In general, it may be said that *celeus* is the more northern species, while further South *carolina* is apt to be much the more common." (Howard.)

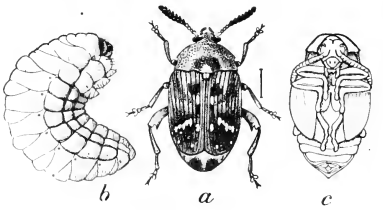

Fig. 54—*Bruchus pisorum*. *a*, Adult beetle. *b*, Larva. *c*, Pupa. All greatly enlarged. Chittenden, Div. Ent. U. S. Dept. Agri. Year Book, 1898.

*Circular No. 42, Div. Ent. U. S. Dept. Agri.

Plants Attacked.—Tobacco, tomato, Irish potato, egg-plant.

REMEDIES.—Hand-picking is sure, and, because of the large size of the worms, readily and easily accomplished. Jamestown (Jimson) weeds are sometimes cultivated, the flowers of which the moths are fond of visiting for the nectar they contain. If these flowers are poisoned with a small quantity of a solution made of cobalt, one ounce; molasses, one pint; water, one pint, the moths will be

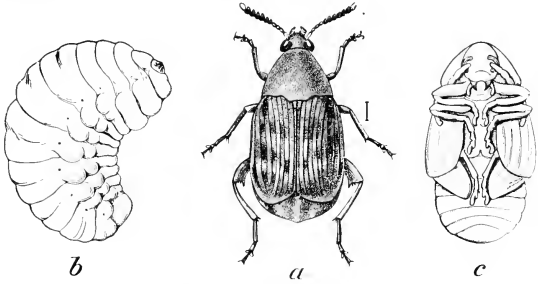

Fig. 55—*Bruchus obtectus*. *a*, Beetle. *b*, Larva. *c*, Pupa. All greatly enlarged. Chittenden, Div. Ent. U. S. Dept. Agri. Year Book, 1898.

destroyed when they suck the flowers for the nectar. This method has been practiced with success in Florida.

WEEVILS, PEA AND BEAN (*Bruchus pisorum*, Linn.; *B. obtectus*, S.; *B. quadrimaculatus*, Fab.).—These weevils are well known by all gardeners, and the damage committed by them is very great. The adult insect deposits its eggs on the inside of the green pod by making a slit on the suture through which the eggs are placed. The grubs enter the seed and feed on the starch stored up by the plant for the germ.

REMEDIES.—Seed, which are attacked by the weevils should be treated with the fumes of carbon bisulphide.

A small quantity of the seeds are placed in a tight box and a portion of the carbon bisulphide is poured over them; another layer of seeds and fresh carbon bisulphide, and this operation is repeated until the box is filled. A close cover is put on and the box allowed to stand for a day or two, when the fumes of the poison will kill all of the insects in the seeds. In the use of this chemical great care must be taken because of its inflammable qualities. *See that no smoking is permitted within the room where the work is being conducted, or a disastrous explosion will result.*

Fig. 56—*Bruchus quadrimaculatus*. *a*, Beetle. *b*, Larva. *c*, Pupa. All enlarged. Chittenden, Div. Ent. U. S. Dept. Agri. Year Book, 1898.

Heterodera radicicola (Greeff). Mull; Nematode root-galls. These are enlargements on the roots of certain plants attacked by a microscopical worm, which causes the swelling by eating the roots. Professor Atkinson, in his study of this worm in Bulletin 9 of the Alabama Experiment Station, gives the following description of the disease: "The surface of the gall is at first smooth, more or less undulate, or papillate, but becomes later roughened, scurfy, or cracked, and finally decay of the tissues sets in. When the roots begin to die they send out new roots in the efforts of the plant to recover from the effects of the disease. These roots in turn are attacked and deformed."

Inasmuch as the worm is found in the tissues of the roots and the openings they make are so minute it is impossible to reach them with the ordinary methods of

applications of vermicides, it is therefore recommended to sterilize the soil by starvation of the worm—that is, planting only those plants which are known to be free from the attacks—and by clean cultivation.

Fig. 57—Nematode on Carrot. California Bulletin.

PLANT DISEASES.

These diseases are referred to what are called fungi, which belong to the Cryptogamic branch of the vegetable kingdom. A fungus is a plant that is devoid of the coloring matter or chlorophyll so necessary in the higher plants for a proper assimilation of the crude food. This coloring matter being absent in the body of the fungus, it becomes necessary for it to seek for its food in the flowering plants, where it is in a condition to be immediately assimilated. The damage, therefore, to the plant is caused by the hyphae, or thread-like forms of the fungus penetrating the tissues and drawing the sap and nutritive fluids, and thus eventually starving the plant to death. These hyphae are either separate or in bundles; and the entire mass of vegetative portion is called mycelium.

The reproduction of the fungus is by means of spores which are developed on the mycelium. These spores under the proper conditions of heat and moisture throw

out fine filaments and rapidly grow into a mature fungus. There are two kinds of these spores, or, rather, two conditions. One stage belongs to the summer period, and is to be found on the surface of the host, while the other belongs to the winter, and is deeply seated in the tissues of the plant upon which the fungus was developed. The fruit and leaves are common places for the latter stage of the fungus.

From the fact that the fungus soon finds its way into the tissues of the host plant it will be readily understood that the application of remedies to the surface will have but little, if any, effect in destroying the disease. We must, therefore, greatly rely upon preventive rather than curative methods.

There are many species of fungi attacking the cultivated plants, and the vigorous investigations of the Experiment Station workers all over the United States are bringing to light new forms each year, but the limited character of this book will permit the mention of only a few of the most destructive and troublesome species.

Bacillus amylovorus (Burrill). Fire blight, frozen sap blight, pear blight. This serious destruction of the pear tree is the result of the attack of a minute bacterium which causes the fermentation of the sap and the leaves to turn a dark brown, and even the wood is made to crack under the freezing and thawing of tissues in their unhealthy condition. By this cracking of the wood the bacteria are often given access to the older portions of the tree. The first attack made by the bacteria is through the nectaries and stigmas of the flowers, in the soft tissues of the twigs and leaves where a wound has been made. When a diseased tree is permitted to stand the germs are transmitted by insects to the healthy trees, as they fly from one flower to another seeking for the nectar. When placed in this favorable condition the

bacteria soon begin to multiply with great activity, and but a short time will elapse before the twig shows a sickly indication.

The only remedy now known is to cut away the diseased portions into the healthy part and carefully burn the wood. This may not in all cases prevent the trouble appearing again, but nothing better is now known.

Cladosporium fulvum (Cke.), *Cladosporium carpophilum* (Thum.) Leaf blight of the tomato and brown spot of the peach, plum and cherry. The first attacks the leaf of the tomato by turning it yellow in spots and eventually covering the entire foliage. (A badly diseased plant is unable to grow leaves and have sufficient vitality to develop fruit also.) The *C. carpophilum* shows on the fruit of the peach, plum and cherry in brown, velvety spots, increasing in size until they run together in the shape of large patches.

The remedy recommended is spraying with Bordeaux mixture every week or so to protect the new leaves and fruit. See the table at the end of this chapter.

Cæoma nitens (Schw.). Red rust of the raspberry and blackberry. This disease lives in the tissues of the plants and breaks through to the surface, where it matures its orange-colored spores, on the under sides of the leaves. The fungus, however, infests the entire plant, and it is supposed that it finds its way into the tissues through the roots. The spores live through the winter in the leaves which fall to the ground. The mycelium is perennial and remains in the stem during the winter.

The only sure remedy is to dig up all diseased canes and burn them. Treat in the same way all wild plants found in the neighborhood containing the rust. Do not plant any species of the raspberry and blackberry in the same locality for three or four years. If but few of the plants are infected spray the healthy ones with copper

sulphate solution or Bordeaux mixture. The *anthracnose* is another disease which is destructive to the raspberry.

Ceratocystis fimbriata (Ell. & Hals.). Sweet potato black rot. The beginning of the disease is shown by the appear-

Fig. 58—Anthracnose of Raspberry. *Glocosporium venetum*. Div. Veg Phys and Path.

ance of dark olive-brown, or green patches, on the young sprouts or upon the potato, entering the tissues. The fungus grows rapidly and soon causes death to the sprout

by girdling, and, in the case of the potato, covering the surface with a dark-green rot. Like other diseases of the fungus kind, the trouble is the result of the mycelium entering the tissues and feeding on the starch grains and cellular tissues.

Only healthy potatoes must be planted for the slips or sprouts, and no sickly slips must be transplanted; do not use hog manures in quantities, as this seems to encourage the development of the fungus; clear the field of all debris and small potatoes after digging; and in case of

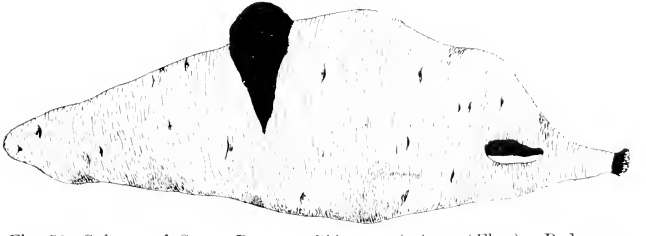

Fig. 59—Soft-rot of Sweet Potato. *Rhizopus nigricans* (Ehr.). Redrawn after Halstead.

infested fields, rotate the crop, planting other than root crops.

Rhizopus nigricans (Ehr.). Soft rot of the sweet potato. Dr. Byron D. Halsted gives the following account of this disease: This form of decay, while it may be met with in the field at digging time, is usually found most destructive in the storeroom, where it causes the attacked roots to quickly become soft and worthless. In the engraving is shown a root in which the mould has penetrated for nearly the whole length of the potato. As a rule, the mould effects an entrance through the upper end of the potato, where the latter was separated from the main root, because the rind of the root, on account of its toughness, in a measure prevents the entrance of the fungus.

Should there be a break at any other point, this provides a suitable point for the attack of the disease. The roots are more or less cut or bruised in harvesting, and these places favor the entrance of the fungus. As the mould advances within the tissue of the plant it exudes a substance which is very active in causing the starch in the potato to dissolve, as also the walls of the cells to become partially decomposed. In this way the juice from the decaying sweet potato is able to induce a similar decay in healthy roots.

It is quite safe to assume that the mould makes its entrance into the potato from the surrounding medium, and usually after the roots have been harvested. It does not, as far as known, begin by infecting the leaves of the growing plant, and then pass down the stem, as is true with the soft rot of the Irish potato. The fact that it finds broken, bruised or cut spots in the roots favorable places for entrance suggests the importance of being careful in harvesting and subsequent handling, that the least possible harm shall come to the skin of the roots. It is also true that the soft rot is greatly favored by a moist atmosphere, especially shortly after digging, at the time the roots are undergoing the process known as "sweating." At this critical period it is very necessary that the potatoes be stored in a well-ventilated room, where a constant temperature of not far from seventy degrees, or about that of a living room, may be sustained. All soft potatoes should be sorted from the healthy ones and destroyed.

Cercospora Apii (Fries.). Celery-leaf blight. The evidence of the fungus is the appearance of pale yellow-green spots on both sides of the leaves, about one-fourth of an inch in diameter. These will soon change to a brown color with a lighter colored center, and, if per-

mitted to have its way, the disease will cause the leaf to dry up and became browned over its entire surface.

Remove all infected leaves and watch the plants for the disease, so that all parts attacked may be destroyed.

Fig. 60—Leaf Curl. *Exoascus deformans.* Berk, on Plum leaves (after Atkinson). Cornell Bulletin 73.

There is no sure remedy in the shape of spraying after the mycelium has found its way into the tissues.

Damping Off (generally attributed to the fungus

Artotrogus debaryanus, Hesse). The disease occurs in the hot-bed or greenhouse, and rots off the young seedlings near the surface of the ground. The tissues are weakened by the attack of the fungus, and the plant falls to the ground. A number of fungi are also responsible for this trouble, and great encouragement is given to them in making the attack by the damp condition of the soil, the high temperature and the humid atmosphere.

In the case of seed beds and greenhouses the remedy is to change the soil and ventilate, and transplant only the healthy plants. Do not water to excess.

Exoascus deformans (Brek.), Fuckel, Peach leaf curl; *Exoascus pruni*, Fuckel, Plum pockets. The peach leaf curl is caused by the attack of a fungus which makes the leaves drop early in the summer, and if the disease is very severe the entire foliage may fall, followed by the fruit. The fungus seems to be developed just after a cold, wet period before the leaves put forth. The curling of the leaf is due to the growth of the mycelium in the tissues, and the spores give the surface a mealy cast. The fungus remains in the fallen leaves and branches through the winter, ready to renew the attack at the opening of the spring.

The remedy recommended by some experimenters is to prune back the twigs and spray with Bordeaux mixture before the buds appear, repeating the operation after the trees are out of bloom and again at the end of two weeks. In the use of the Bordeaux mixture care must be taken to have an excess of lime in the mixture, so as to prevent injury to the leaves.

The plum pockets are the diseased fruits on the plum tree. The mycelium pass the winter in the fruit-bearing branches, and as soon as the ovaries appear in the spring the fungus enters them and stimulates them so that the plum becomes enlarged and the tissues dry up and assume a spongy cast.

The diseased fruits and branches should be burned, and in the spring the trees must be sprayed with solution of copper sulphate, which will help greatly in checking the fungus, and an occasional application of Bordeaux mixture will still further overcome the trouble.

Fig 61—Apple Scab *Fusicladium dendriticum.*

Entomosporium maculatum (Lev.). Leaf blight and cracking of the pear; also found on the quince. This fungus first makes its appearance on the leaves as small, brown spots which soon enlarge to considerable patches. Later in the season black spots are seen in the center of the brown patches, which are the spores. The disease begins early in the spring, and the entire foliage will become

infested, and the tree will become defoliated. In many instances the wood and the fruit also become affected with the fungus. In the case of the fruit the surface shows carmine red spots, which turn dark afterwards, and the skin becomes roughened and then cracks, making an unsightly fruit for market.

This disease can be kept in check by the use of Bordeaux mixture at intervals of two weeks until about the 1st of August. The first application should be made before the buds appear and three others at intervals of ten days. Burn all leaves which fall from the tree that is affected with the disease.

Fusicladium dendriticum (Fckl.). Apple scab, leaf blight, or leaf mildew. There are apparently two forms of this fungus, one attacking the leaves and the other the fruit; but, in fact, it is the same disease. For some years prior to 1873 it was supposed by observers to be two distinct fungi, but Professor M. C. Cooke has shown that they are identical. The appearance on the leaves is in the form of small olive-green spots, which as they increase in size assume a velvety appearance with the borders more or less irregular. The fruit shows a similar condition of the attack. There is generally a light colored ring around the borders of the spot. It has been determined that dry, hot summers are unfavorable to the development of the fungus, while wet springs and summers, and a cool condition of the atmosphere, will cause the fungi to grow with considerable vigor.

This fungus does not penetrate far into the tissues, and in its first stages it is exposed on the surface of the leaves and fruit, so that spraying will kill the spores, but the difficulty consists in the fact that the solutions which are strong enough to accomplish this end will also destroy the foliage of the tree. We must, therefore, commence spraying in early spring before the buds begin to

expand, using a solution of sulphate of copper. When the blossoms have fallen repeat the spraying with the Bordeaux mixture, and make two or three applications if the season is wet.

Laestadia bidwelli (Ell.), Via. and Rav. Black rot of the grape. This disease attacks both the fruit and the leaves, the former most severely. When about full grown there appear on the grapes spots of a brown or purple color, which in a few days extend over the entire surface, with the center somewhat darker. Black pimples over the diseased part are characteristic features of the fungus. The fruit soon shrinks up and remains on the vine for a period as late as winter. On the leaves the spots are reddish brown dispersed between the veins. The disease is detected here some days before the attack is made on the fruit.

Fig. 62—*Laestadia bidwelli* (Ell.). Via & Rav. Div. Botany, U. S. Dept. Agri.

Since the fungus makes its appearance so late in the season after the fruit is well advanced, it becomes rather a difficult problem to destroy the disease if the spraying is postponed, without staining the grapes. It is, there-

fore, important that early applications of Bordeaux mixture be made, and as thoroughly as possible—beginning before the blossoms open, and repeating the spraying three or four times, with a week or ten days intervening between each application, care being taken not to extend the spraying until the fruit is stained.

Monilia fructigena (Pers.). The rot of peach, plum, quince, and cherry. *"The fungus makes its appearance

Fig. 63—*Monilia fructigena*. Geneva, N. Y., Bulletin 86.

on the flowers soon after or about the time the petals fall. At first a slight discoloration appears at a given point; this rapidly increases in size until at length the entire flower assumes a brownish hue.

"After killing the flower the fungus frequently attacks the pedicels, where it produces similar discolorations to those described above. The dead flowers usually remain on the tree for three or four weeks, then if the weather is wet they begin falling, and as they consist at this time of a soft mass of rotten tissue they stick to any part of

*B. T. Galloway, Sec. Veg. Path. Report, Department Agriculture, 1888.

the tree with which they come in contact; many fall upon the leaves and young fruit and become so firmly attached that no ordinary rain or wind will remove them. Careful experiments have shown that the rotting flowers are highly infectious, and that wherever they touch the leaves or fruit decay sets in.

"On the leaves the presence of the fungus is first made manifest by a slight discoloration of the tissue around the point of infection; this gradually enlarges, and at the same time the normal healthy green color changes to a reddish-brown. . . During wet weather the spots on the upper surface of the leaf are frequently studded with little tufts of fungus; these have a mealy or pulverulent appearance, and are easily washed off by the rains or removed by the wind.

"As in the case of the leaves, the fruit is often infected by means of the diseased flowers. At first there appears a brownish circular spot on one side of the cherry; this rapidly enlarges and soon the entire fruit becomes brown, shrunken, and soft. Ultimately the fruit stalk is attacked and finally the whole either falls to the ground and dries up, or remains hanging on the tree throughout the summer, or until the following spring. The fruit is often covered with tufts of the fungus similar to those occurring upon the leaves, and while in this condition they are highly infectious, causing all the fruit with which they come in contact to rot."

The remedy recommended is spraying with Bordeaux mixture just before the blossoms open, again just after the blossoms fall, and about ten days after with another spraying of the Bordeaux mixture. Some doubt the entire efficiency of spraying, and its advisability is an open question. Precaution must be exercised in its use, particularly with the peach, which is so liable to injury from the chemicals.

Alternaria Solani (E. and M.) Sor. Early or leaf blight of the potato. This disease is readily recognized by the

Fig. 64—*Oedema*. Leaf Curl of Tomato (Atkinson). Cornell Experiment Station Bulletin.

peculiar folding of the edges of the leaves, resulting from the shrinking of the tissue after the attack of the fungus

has destroyed the vitality of the cells. The attack begins with a small spot, which gradually enlarges until most of the leaf surface is involved, and, unless the disease is checked, the entire plant is so injured its power to produce tubers is destroyed.

The remedy for this disease is Bordeaux mixture sprayed on the plants just after they are six inches high, and continued at intervals of two weeks until June 1st.

Oedema. Leaf curl of the tomato. The disease is manifested by the rolling up of the leaves exposing the under surfaces. The veins are very much swollen, and the leaves become more or less brittle. The illustration of this disease is copied from Bulletin 53 of the Cornell Station by Professor G. F. Atkinson. The attack is made on the older leaves first, and the plant dies from the base upwards.

Experience has shown that the disease is caused frequently by an excess of water in the soil, or by a too liberal use of ammoniacal fertilizers, so that irrigation will help to retard the disease and judicious application of fertilizers will prevent too vigorous growth of soft tissue, which seems to be subject to the disease.

Oospora scabies. Potato scab. A delicate white mold first makes its appearance on the surface of the potato (Irish), and the scab is developed by the tissues of the tuber, at the point of attack, forming a layer of cork as a protection against the fungus parasite. As the potato grows this diseased place begins to crack and becomes roughened. Very soon the entire hill of tubers becomes infected.

The remedy is preventive rather than curative. A large per cent. of organic matter in the soil seems to encourage the development of the disease, and where lime and stable manure are used in large quantities there is danger of having this parasite on the crop. Scabby

potatoes must not be planted, because this will infect the soil and give trouble. Stable manure secured from animals fed on potatoes and beets is liable to produce the disease. Rotation must be practiced and clean culture must be the rule.

Peach yellows; Peach rosette. These two diseases are not yet well understood. The cause is unknown, but the effects have been carefully examined by pathologists, and the diseases have been pronounced virulently contagious. The yellows have not been located positively farther

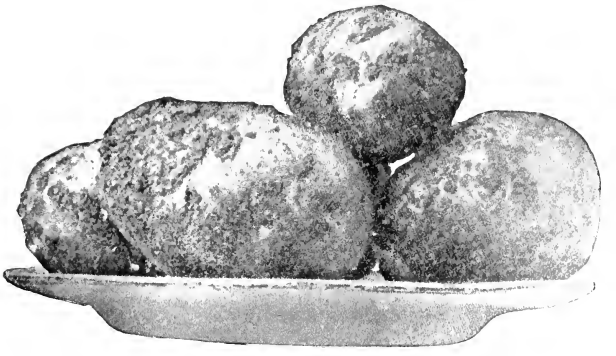

Fig. 65—*Oospora scabies.* Cornell Experiment Station, Bulletin 113.

south than Virginia, but there is constant danger of its introduction at any time by means of the diseased stock brought from the infected districts. Peach yellows manifests its presence by the premature ripening of the fruit, with bright red blotches over the skin and into the flesh, penetrating almost to the center of the peach, producing an unnatural coloring. There is also a premature unfolding of the leaf buds into pale, sickly growths, giving the tree an unhealthy look. The fruit has a bitter, unpleasant taste. The tree gradually succumbs to the

attack, and in the course of two or three years will die entirely.

The rosette is somewhat similar to yellows in its methods of attack, but it is more decided in its appearance. "It may first attack part of a tree and then the remainder, the same as yellows, but it is more likely to appear at once in the whole tree, and generally in early spring. In trees attacked in this manner all of the leaf buds grow into compact tufts or rosettes. These rosettes, although seldom more than two or three inches long, usually contain several hundred small leaves. A tree thus attacked always dies the following autumn or winter. The prevailing color of the foliage is yellowish green or olivaceous." (Erwin F. Smith in Farmers' Bulletin No. 17.)

The only sure remedy is to dig up the infected trees and carefully burn them, otherwise the disease will soon spread throughout the entire orchard.

Plowrightia morbosa (Sacc.). The black knot of the plum. This is an excrescence growing upon the bark and young wood. The bark swells and bursts, and finally assumes the appearance of a large, irregular lump, with a hard, cracked, uneven surface. The flow of sap is obstructed by this tumor, and the poison is gradually disseminated over the whole tree. The Morello cherry is also subject to the attacks of this disease. It made its appearance in Athens, Georgia, for the first time in the year 1853 on a tree from the North. The black, rough condition of the knot is its last stage. When the tree is first infected the trouble is not so clear to the ordinary observer, and the disease obtains a strong foothold before one is aware of its presence. The development is accomplished in the following manner. If an examination is made of the surface of one of the black knots small pimples will be detected in which the spores, or so-called seeds, are

located. These spores are carried by the wind to other trees, and, finding lodgement, soon germinate and send mycelii into the tissues of the plum, where growth is

Fig. 66—*Plowrightia morbosa* (Sacc.), Mass. (State) Exp. Station, Report 1892. J. E. Humphray.

continued until spring, when the presence of the disease is manifested.

The only remedy is to cut off every branch or twig that shows a tumor, and burn it at once; and be sure to cut

several inches below the point of attack, so that all mycelii will be taken out, otherwise the trouble will make its appearance again.

Phytophthora infestans (DeBary). Potato rot; late blight, or downy mildew. The leaves turn a brown color in large, irregular spots, the unattacked portions of the leaves remaining green. The tubers are also destroyed by this disease, and become a dark color, shrivelling up and, where the attack is rapid, giving out considerable moisture in the rotten portions.

The remedy is to spray the vines several times with the Bordeaux mixture, beginning when the plants are only a few inches above the surface of the ground, and repeating at intervals of two weeks.

BLIGHT OF THE ORANGE.* Wilt or leaf curl. This is a common disease in Florida, and it is considered to be incurable. It attacks most of the citrus fruits; but it does not generally make its appearance until the tree is old enough to bear fruit. It is a peculiar disease found only in Florida, and it is widely distributed over the State. The blight comes rather suddenly, and its presence is at first manifested by the wilting of the leaves, followed by their falling, until the branches are denuded of foliage.

Inasmuch as there is no remedy for this disease, the tree affected must be cut out at once and destroyed, because the healthy trees in the grove will soon become infected, and the entire orchard will die. It is useless to treat blighted trees, and money and time will be wasted by adopting any remedy recommended; the only sure method is the heroic one of cutting out and burning all trees affected.

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*Bulletin 8, Vegetable Physiology and Pathology, U. S. Dept. Agri.

DIE BACK (*Exanthema*).* This disease is also known only in Florida, and is widely distributed over the State. As the name implies, the disease causes the vigorous new growth to die back in early spring, and the yield of fruit is consequently reduced.

"The order in which the symptoms appear and their severity vary greatly, but are generally as follows: The first sign of the disease is the unusually dark-green color of the foliage, rank growth and large, thick-skinned fruit. These symptoms are soon followed by the staining and dying back of a few twigs, and by brown stains formed on some of the fruits. The fruits developed are prone to split and drop prematurely. In the first stage of the disease either the stained fruit, or the stained, dying twigs must be present to determine with certainty the presence of the malady. Trees affected with the disease may grow for years and show only one of these character symptoms; in other cases all symptoms may be present, but to a very slight extent, so that careful search must be made to find them. As the disease progresses the brown staining of the fruit and twigs become very abundant, and the dying back of the twigs occur all over the tree; eruptions form on the young and old twigs; nodal swellings, due to the gum pockets, become very abundant, and the tree assumes the dense foliage and regular outline described above. In this stage of the disease many fruits set, but they usually turn yellow, become stained, split and fall before maturity, only a few, if any, reaching full size. Soon the gum eruptions extend to the old limbs and these die back. The rank growth becomes limited to the center of the tree; here branches grow luxuriantly for a time, only to become stained and die back later."

TREATMENT.—Reducing the amount of highly nitro-

*Bulletin 8, Vegetable Physiology and Pathology, U. S. Dept. Agri.

genous organic fertilizers, and allowing the land to grow up in weeds, will sometimes remedy the evil. In renewing the fertilizing materials use potash and phosphoric acid, and, as the tree begins to recover, add a little nitrate of soda or sulphate of ammonia until the tree is brought to its normal condition again. Low, wet soils will also produce this disease, and in that case, thorough drainage must be resorted to.

SCAB OF THE LEMON (*Verrucosis*).* The leaves affected with this disease exhibit small, wart-like excrescences of various sizes; in some cases running together and covering a large portion of the leaf or fruit. At first these warts look like small semi-transparent pimples of a slightly lighter shade of green than the surrounding surface. In a few days these warts assume a more prominent form, and present a watery cast. Then a fungus makes its appearance, which is at first gray, then dusky, and at last black. Finally the tissue covering the tips of the warts is cut off from the healthy tissue below by the formation of cork, and ultimately this cork formation becomes so abundant as to give a dingy white color to the old warts.

TREATMENT.—Proper application of ammoniacal solution of copper carbonate will be found efficient. Remove all infected fruit from the tree and the ground before the blooming begins. Destroy all sour orange trees in the vicinity of the lemon trees, because these are very susceptible to the disease, and will give trouble. Spray with the ammoniacal solution of copper carbonate first when the fruit begins to appear; spray a second time two weeks after; and a third spraying may be required two or three weeks later, when the blooming season is over.

The ammoniacal solution of copper carbonate is made

*Bulletin 8, Vegetable Physiology and Pathology, U. S. Dept. Agri.

by taking 5 ounces of copper carbonate and mixing with 1 pint of water to a thick paste; dilute with $1\frac{1}{2}$ gallons of water in a wooden bucket; stir vigorously, and at the same time add 2 pints of strong ammonia, or $5\frac{1}{2}$ pints of ammonia water; when dissolved dilute to 50 gallons by the addition of water.

SPRAYING APPARATUS AND METHODS.

No garden or orchard is well equipped without the apparatus necessary to combat the attacks of insects and

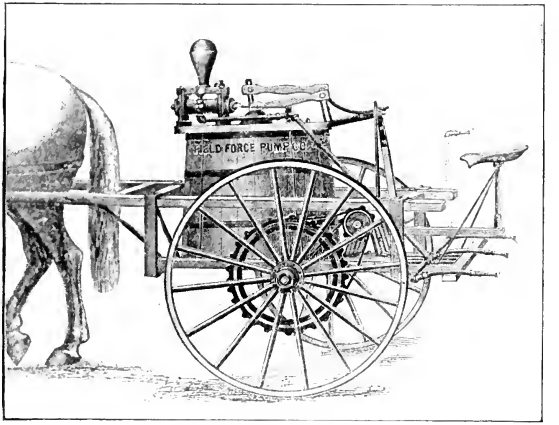


Fig. 67—Victor Spraying Machine.

fungi. The experiment stations have studied so carefully and thoroughly the subject of spraying and its appliances, and have published, within the past ten years, so many bulletins containing hundreds of pages of valuable advice to those contemplating spraying, that the practice has become almost as universal among fruit growers and market gardeners as is the use of commercial fertilizers

among farmers. In the preparation of this chapter very liberal use has been made of these bulletins, and the reader is advised to secure these publications if fuller information is desired on any point not elaborated in this book. In fact, the wise gardener will have his name entered on the mailing lists of these stations so that all bulletins relating to vegetables and their cultivation may be sent him. These bulletins are sent free to any one who will apply for them.

There are numerous spraying pumps and appliances

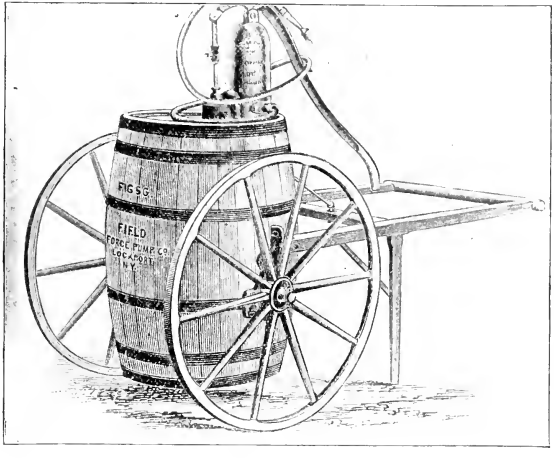


Fig. 68—Barrel Truck for Spraying.

on the market, some of which are cheap and others are quite expensive. In the purchase of an outfit, however, the following essentials must be carefully noted and insisted upon, if effective and satisfactory service is to be secured: 1. Durability; 2. Capacity for work contemplated; 3. Simplicity in construction; 4. Ease with which the

parts may be reached and separated for repair; 5. Efficiency of agitator; 6. Non-corrosive parts which are brought in contact with the liquids.

Fig. 69 Bellows. Large Single Cone.

Experiments have proven that the following apparatus will meet most of these requisites:

One of the simplest forms for applying dry powders is shown in Figure 69. The powder is placed in the cone-shaped vessel, at the bottom of which is an orifice, and

Fig. 70—The Leggett Powder Gun.

through this the powder can sift, and, by working the bellows, the poison is forced out over the plants. Another form is shown in Figure 70, known as Leggett's powder gun. The reservoir containing the insecticides is located

near the middle of the gun, and by turning a crank a fan is operated which blows the powder out through the tube on the plant where desired. The reservoir contains about one quart, and the holes in the base are adjustable, so that any amount of powder may be sent out at any time desired.

Knapsack sprayers are made to hold about five gallons

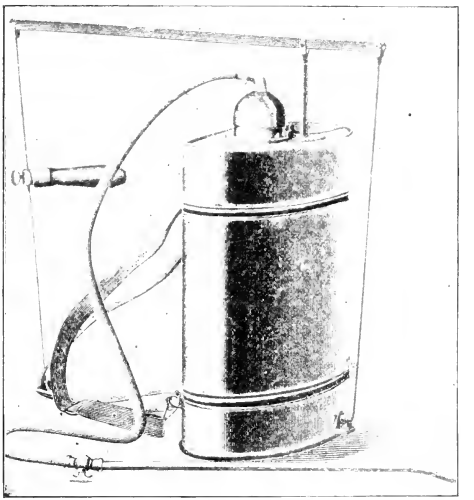
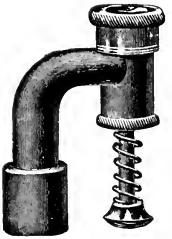


Fig. 71—Knapsack Sprayer.

of the spraying materials, and the apparatus is so constructed as to enable the manipulator to carry the machine on his shoulders. The discharge pipe should enter the top of the tank, and not at the bottom. Where the pipe enters the bottom it frequently becomes clogged with the mixtures, thus producing continual sources of annoyance. The valves are supplied with rubber balls,

which should be substituted with marbles when kerosene emulsion is used, because the kerosene causes rubber to swell and close the orifice. Figure 71 gives the general form of these knapsack sprayers.

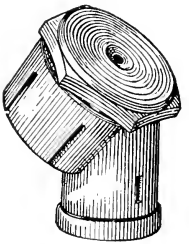
When a considerable area of the garden or orchard is



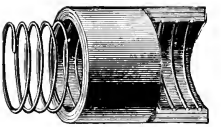
Cyclone Nozzle, with Direct Charge and Disgorger for Thin Sprays.

Cyclone Nozzle, with Lateral Discharge for Thin Sprays.

Bamboo Extension Pipe with Valve and Hose Coupling.



Heavy Cyclone Nozzle, with Oblique Discharge for Thick Sprays.



Wire Extended Suction Hose.

The above illustrations are from Bulletin No. 20, Division of Vegetable Physiology and Pathology.

Fig. 72—VERMOREL NOZZLES.

to be treated it becomes necessary to use larger machines for holding the spraying materials. The best patterns have the force pump attached to barrels, as is shown in

Figures 67 and 68. These machines are so constructed that as the pumping is carried on the fluids are kept in constant motion, insuring a more perfect mixture of the ingredients.

The nozzle used in the working of these spraying machines is a very important item. The best nozzle is the one which sends out a fine spray over all portions of the plant. It is not desirable to drench the tree until the liquid runs off on the ground, but every part must be well covered where there are indications of fungi or attacks from insects. The Vermorel nozzle is considered to be one of the best on the market. However, it throws the fine spray but a few feet from the orifice, and this is a

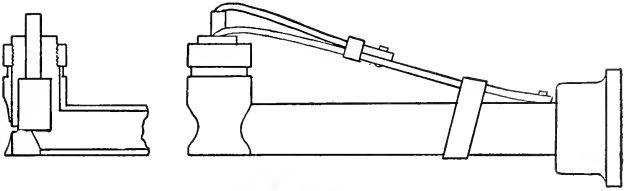
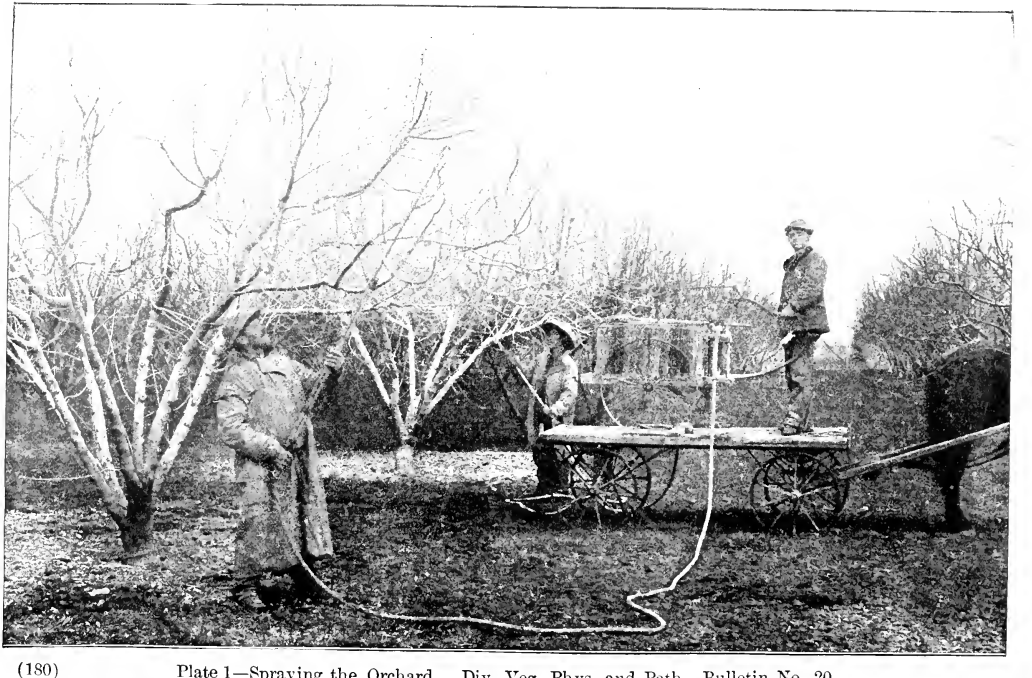


Fig. 73—McGowan's Nozzle.

disadvantage where tall trees are to be treated. This difficulty may be obviated by using a bamboo extension. This is a bamboo cane in which is placed a ⅜-inch brass tube with couplings to enable the manipulator to attach it to the nozzle, and to the tank containing the spraying materials.

The McGowan nozzle is considered by many gardeners to possess the advantage over the Vermorel form in the fact that it not only sends out a fine spray, but it is thrown with such force as to reach the highest trees in the orchard. In this respect it has its advantages. It is generally conceded, however, that for short distances the Vermorel is the best sprayer, particularly for knapsack work. It is good policy, where the gardener can afford it,



(180) Plate 1—Spraying the Orchard. Div. Veg. Phys. and Path., Bulletin No. 20.

to keep both patterns on hand, so that any character of work in the spraying line needed in the garden and orchard may be carried on with the least delay and trouble.

In the use of the spraying material judgment must be exercised. Of course, one solution will not do for all purposes, and the gardener must first determine what character of disease the plant has before making the

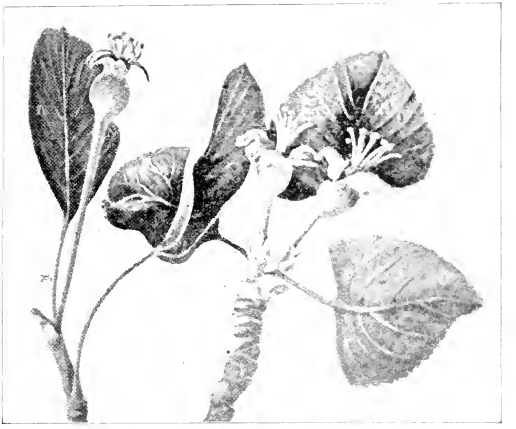


Fig. 74—Just right to spray for Codling Moth. Cornell Exp. Station Bulletin 142.

application of the remedy, otherwise his labor may be thrown away. As a general guide in this matter, the following rules are given:

1. Do not spray the plants while in bloom, because the delicate organs may be injured; insects which are beneficial, such as bees, etc., may be destroyed.

2. There are a number of different formulae recommended by writers on the subject of spraying, but the experience of our best horticulturists and gardeners has

reduced them to two fungicides, viz.: Bordeaux mixture and ammoniacal carbonate of copper, and two insecticides, viz.: Paris green for chewing insects and kerosene emulsion for those insects which feed by sucking. In the calendar given at the end of this chapter other formulae are given which may be relied on, but, as has been already said, the four mentioned above will be found sufficient for nearly all cases.

3. The lime solution and the sulphate of copper should be passed through a fine strainer and the former (milk

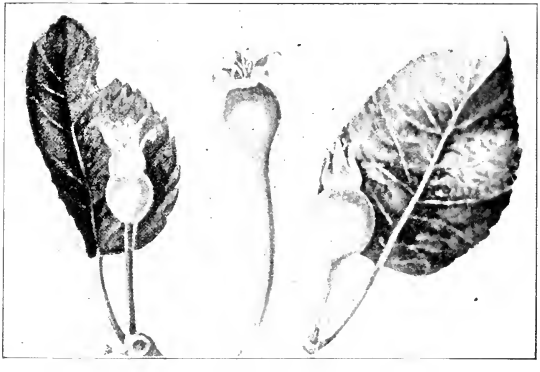


Fig. 75—Almost too late to spray. Cornell Exp. Sta. Bull. 142.

of lime) must be cold before mixing with the copper solution, otherwise the blue color characteristic of the Bordeaux may not be secured.

4. Unless the spraying is well performed the labor will be lost. Be sure that all portions of the plant diseased are reached with the preparation, because if a small surface is omitted an active center of disease may continue its growth, and in a short time the plant will be in a bad plight.

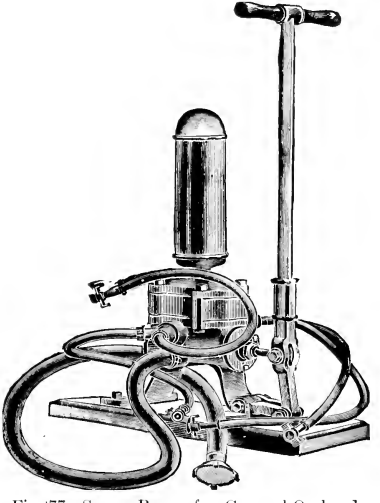


Fig. 77—Spray Pump for General Orchard Work, with Upright Lever.

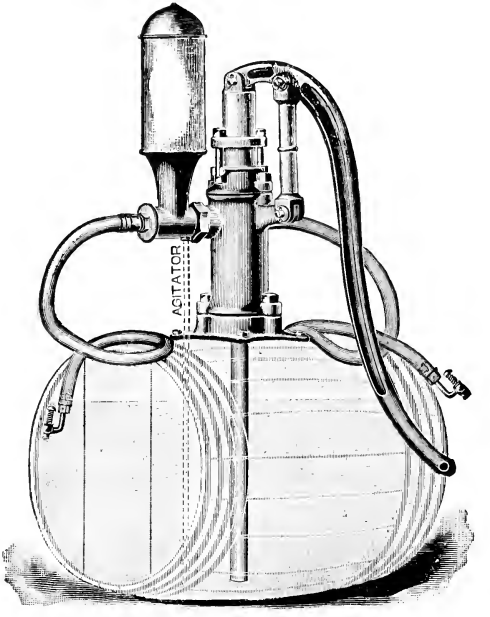


Fig. 76—Spray Pump for Use on Barrel or Tank.

5. Before any application of the spraying solution is made a careful examination of the plants must be made to determine, as far as possible, what is the character of the attack, whether made by insects or by fungi. The calendar at the end of this chapter will largely assist the operator in determining this question of suitable spray-

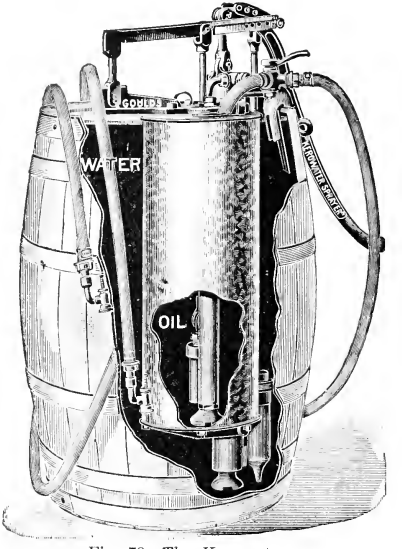


Fig. 78—The Kerowater.

ing mixture as soon as the character of the disease is known. For instance, "it would be useless to spray with kerosene emulsion to repress mildew, to combat currant worms with Bordeaux mixture, or to apply Paris green for an attack of plant lice." (Geneva Exp. Station.)

6. Some of these mixtures are poisonous, and great care must be exercised in their use so as to prevent serious accidents. Another point must be remembered,

viz.: that these fungicides and insecticides are not curatives of the disease, but are simply preventatives, so the spraying must be done at the proper times in order to reach the cause of the trouble before it is too deeply rooted in the tissues of the plant. Secure the best labor for this work, and use the best machines procurable.

THE KEROWATER.—The demand for a sprayer that will unite the kerosene oil and water when needed, and at the moment that the two come from the machine, has induced the Gould Manufacturing Company of Seneca Falls, New York, to devise the "Kerowater," which in many respects is a handy and convenient sprayer. The kerosene oil is placed in the oil tank located within the barrel, which is clearly indicated in the figure. The water is placed in the barrel. Each tank has its own pump, and the two fluids do not come together until they reach the discharge pipe, and the proportion of kerosene oil is maintained at the will of the operator. The use of this and similar machines obviates the necessity of preparing the emulsion beforehand.

CHAPTER IX.

PROPAGATION OF PLANTS.

There are two modes of propagating plants, viz.: *by seed* and *by division*. Species are propagated by seed, but varieties, except in the case of annuals, generally by division, as they do not always continue true from seed. There are also two modes of *propagating by division;* in the one, the plants root in the ground as suckers, layers, and cuttings, and in the other they are made to unite with another plant, as in budding, grafting, and inarching. While all plants are naturally multiplied by seed, most kinds also allow of propagation by division, as by taking offsets, or parting their roots, by suckers, cuttings, runners, layers, etc. Propagation by seed often produces new varieties, which are only to be perpetuated by division of their roots, cuttings, layers, or by budding and grafting upon stocks.

PROPAGATION BY SEED.—The most healthy and vigorous plants are generally produced by seed, though many varieties can only be perpetuated by propagating by division. The following conditions are necessary, says Thompson, for successful propagation by seed: 1. That the seeds be perfectly ripened. 2. That they have been properly kept until the period of sowing. 3. That they be sown at the proper time; and, finally, that the sowing be performed in the proper manner. And it may be added that to accomplish the object of sowing, the seeds sown must be of just the kind intended to be used, and true to that kind.

THE MATURITY AND SOUNDNESS OF SEEDS are necessary to ensure the growth and perfection of the young

plant. These can generally be determined by their external and internal appearance. If in cutting the larger seeds the substance of the seed be of the natural color, and the embryo be fresh and perfect, it will probably germinate. So if externally they have a clear color and a fresh, plump appearance, they will be likely to grow. The soundness of those that sink in water when good (and most seeds do), may be tested by putting them in warm water. Nearly all sound seeds will sink in this fluid in a short time. Of the finer seeds, a skillful eye will determine the quality with the microscope. But the surest test is planting a few properly in a pot, protecting the surface from drying with a square of glass, and keeping it in a warm room, or plunged in a hot-bed or in a pit, giving it the heat naturally required by the species for germination. A simple seed tester can be made by the use of cheese cloth, on which the seed are spread, covered with another cloth and placed on moist sand, the whole covered with a board slightly raised to permit of circulation of air.

Seeds are more often unsound from mouldiness or age than from not having been properly ripened. They should be stored where they will be least affected by the presence of moisture and the changes of temperature. About 40°, but not lower, is said to be the best. Many oily seeds become rancid, and will not vegetate when sown.

Generally, seeds should be kept dry, but acorns and chestnuts thus kept soon lose their vitality, and must be kept until planted in rather dry loam, or slightly dampened moss, well packed. Nearly all seeds keep better in closely packed dry soil, the air being thus mostly excluded, than hermetically sealed in bottles. In close stopped bottles or jugs, the air often becomes saturated with the moisture and exhalations from the seeds, which, in the impure, damp, close atmosphere, soon become com-

pletely spoiled. But peas, beans, and other seeds, where liable to insects, after they are well dried, should be put in bottles well corked, and a few drops of spirits of turpentine, of chloroform, or a bit of camphor, put in with the seeds. Either of these is fatal to the insects. For most seeds it is sufficient that they be gathered, when fully ripe, in dry weather, and thoroughly dried before they are threshed. If any moisture then appears, dry them further, and store in paper bags where they will be free from damp and vermin. In the first column of the following table is given the time that certain seeds will keep, according to Vilmorin; the second column gives the earlier table of Cobbet. It is generally best to select fresh seeds, as seeds lose their vitality very soon.

	Years.		*Years.*		*Years.*
Artichoke	5— 3	Dock	3— 1	Pennyroyal	— 2
Asparagus	4— 4	Endive	9— 4	Potato (Sweet)	2— 3
Balm	— 2	Eggplant	— 7	Potato (Irish)	— 3
Basil	6— 2	Fennel	5— 5	Pumpkin	5—10
Bean	6— 2	Garlick	— 3	Purslane	8— 2
" (Kidney)	3— 1	Gourd	5—10	Radish	5— 2
Beet	5—10	Hop	— 2	Rampion	5— 2
Borage	3— 4	Horseradish	— 4	Rape	— 4
Broccoli	5— 4	Hyssop	— 6	Rhubarb	3— 1
Burnet	2— 6	Jerusalem Artichoke	— 3	Rosemary	4— 3
Cabbage	5— 4	Kale	5— 4	Rue	— 3
Calabash	5— 7	" (Sea)	3— 3	Rutabaga	5— 4
Camomile	— 2	Lavender	— 2	Sage	— 3
Capsicum	4— 2	Leek	2— 2	Salsify	2— 2
Caraway	2— 4	Lentil	— 3	Samphire	— 2
Carrot	4— 1	Lettuce	5— 2	Savory	3— 2
Cauliflower	5— 4	Mangel Wurzel	5—10	Scorzonera	2— 2
Celery	— 10	Marjoram	2— 4	Shalot	— 4
Chervil	2— 6	Marigold	— 3	Skirret	2— 4
Chives	2— 3	Melon	5—10	Sorrel	2— 7
Corn	2— 3	Mint	— 4	Spinach	5— 4
Corn-Salad	5— 2	Mustard	5— 4	Squash	5—10
Coriander	— 3	Nasturtium	5— 2	Tansy	— 8
Cress	5— 3	Okra	— 4	Tarragon	— 4
" (Winter)	3—	Onion	2— 2	Thyme	2— 2
" (Water)	4—	Parsley	3— 6	Tomato	5— 2
Cucumber	5—10	Parsnip	2— 1	Turnip	5— 4
Dandelion	—10	Pea (English)	4— 1	Wormwood	— 2

THE TIME OF SOWING all indigenous seeds in any locality is most favorable when they naturally fall from the plants. Hardy annuals, likewise, do much better if sown in autumn, or quite early in the spring. If not in the ground early, they flower late and badly. There are some exceptions, as in the case of haws and cedar berries,

which hang until swallowed by birds, and sprout more freely after having undergone the digestive process. Some exotics of a hardy character likewise succeed best when sown at the time the seed falls, vegetating in autumn, growing slowly through the colder months, and progressing rapidly when spring opens. Others coming from a different climate, starting into growth in autumn, would perish during the winter months; but kept and sown when the temperature of the air and soil in spring is suitable for vegetating them, they will advance rapidly as the weather becomes more and more favorable to growth. In some cases, where it might be best to sow at the natural period, if the aim was simply to continue the species, other motives render it necessary to sow at other times. A succession of flowers or a continued supply of vegetables during the season may, in the case of annual or biennial plants, make repeated sowings at proper intervals desirable.

Trees and shrubs it is well to sow, if practicable, at the natural period, but it is desirable that the seedlings should not make their appearance above ground until a favorable season for growth. This is most readily secured in the case of seeds that do not keep well dry, by *stratification* or mixing them with soil in autumn, but not encouraging growth until spring. This is done by placing a layer of seeds upon the surface of the soil, then a layer an inch or two thick of sand or light soil, and so on, the whole being laid so as to form a cone, over which is spread a covering of soil to protect from wet and frost. This should be done where least likely to invite the attacks of mice and other animals. Small quantities of seeds of this kind may be stratified in boxes and flower pots, covered from rats and mice and placed in a cool situation until spring. Holly seed requires to be kept thus two years. When vegetation begins to take place, the seeds, still mixed

with the earth in which they have lain, can be sown in soil properly prepared. The larger seeds can be taken from the soil and planted out in the drills at proper distances.

SEEDS MUST BE SOWN IN THE PROPER MANNER.—Seedsmen are often blamed for selling bad seed, when the sole fault is with the planter. That seed may germinate, moisture, air, and a certain degree of warmth, varying with each variety, are necessary. Chickweed will vegetate at 32° F., but for most seeds of plants of temperate climates the best germinating temperature is about 60° F.; of half-hardy plants 70° F.; of tropical plants about 80° F.; but some require 100° F.

Light must also be excluded until the root can derive nourishment from the soil. The first effect of air, heat, and moisture upon the seed is to change its starchy matter into the proper food of the embryo. If at this time the seed be withered by exposure to heat without sufficient covering, it will perish. It often happens that seeds are planted in a fresh-dug soil, and the above change in the properties of the seed takes place, but the earth not being *pressed* upon it, the seed dries up and the embryo perishes. Others, again, are buried too deeply, and though the seed swells, yet sufficient air and warmth are not obtained to give the embryo life. The seed should be just so far covered as to exclude light, and afford barely sufficient moisture for its wants. The first thing in sowing is a suitable preparation of the soil, so that the young roots thrown out may easily penetrate it. It must be made more or less fine for different seeds. Peas and beans do not require the soil to be as finely pulverized as small seeds. The seeds must also be firmly fixed in the soil, and pressed by the earth in every part, in order to retain moisture sufficient to encourage vegetation; but they should not be so deeply buried as to be deprived of

air, or have their ascending shoots impeded by too much soil above. In all cases, seeds should be sown in fresh-dug soil, that they may have the benefit of the moisture therein, but they should never be put in when the soil is really wet, as the ground will bake and the seed perish. Moist weather in summer is excellent for putting in seeds, provided the ground is still friable. Just before a light rain is the best possible time for sowing turnips and other summer-sown crops.

Seeds of most kinds should be sown in drills or rows. In these they can be placed at any required depth, while if broadcast, some will be uncovered, and others too deeply buried in the earth. If sown in drills you will know where to look for the young plants, and they can have the soil dug around them, which will enable them to grow much faster, and are much more easily thinned and cultivated. When the seeds are planted, the earth should generally be pressed upon them with a roller, by treading with the feet, in the case of large seeds, and for the smaller by smoothing the surface with the back of a spade, or by walking over them on a board. Pressing the earth upon them will retain the moisture about them, and hasten their vegetation. When they come up, keep them free from weeds, and thin them as hereafter directed in treating of each plant.

A great deal of the subsequent growth of the plant depends upon their not being sown too thickly, or at any rate upon being thinned properly as soon as the young seedlings appear. A plant raised among a lot of crowded seedlings is very apt to die before it has made its fourth leaf. This seldom happens if the seeds are sown thin, and a little powdered charcoal is mixed with the earth.

Some seeds, which, like those of the carrot, adhere together, must be rubbed in the hands with dry sand to insure a more equal distribution in the drill. Others,

like the beet, are covered with a hard shell, and others still with a tough skin. Both kinds may be soaked in water until the shell or skin is somewhat softened, and by notching into the covering germination is hastened. For broadcast sowing, very small seeds are often mixed with fine soil in order to ensure their being scattered more equally.

Very often seeds fail to come up because they are sown too deep or because they are sown in very dry earth. Other causes of failure are excessive moisture and either excess or lack of bottom heat. M. Appelius observes that seedlings raised in hot-beds or frames frequently cause disappointment from bad management. Asters, Stocks, Phlox, Petunias, Pansies, etc., do better in a very mild hot-bed, and produce stronger plants less likely to die off. When the dung of a hot-bed has given off its first heat, it begins to absorb moisture from the earth with which it is covered. And as the earth of the bed generally slopes to the south, the greater part of the water given off runs toward the front, and at the back of the bed the earth in which the seeds are sown is often too dry. Hence seeds that vegetate slowly and need constant damp, as Phlox and Pansy, should be sown at the front of the bed, and those that grow more readily at the top or back. The time required for certain seeds to germinate at a temperature of from 52° to 65° is as follows (M. Appelius): Garden cress, 2 days; spinach, 3; cabbage, turnip, and lettuce, 4; peas, endive, poppy, melons, cucumbers, mustard, 5; lupine, lentil, horseradish, radish, onions (often also in 15 days), leeks, 6; barley, rye, maize, broccoli, beans, beet, 7; wheat, thyme, marjoram, and some kidney beans, 8; marrowfat peas, 9; vetch, sugar beet, tobacco, hemp, 10; tomato, sea-kale, scorzonera, carrots, savory, basil, stocks, celery, 12 (turnip rooted celery sometimes 20); anise, fennel, 13;

sunflower, artichoke, burnet, 14; balm, clover, 15; lavender, purslane, 16; sage, pepper, 20; parsnip, parsley, asparagus, 21; and potato in 28 days. It seems that seeds lighter than water do not germinate so soon as those heavier.

Though seeds will vegetate with due supplies of heat and moisture, a fertile soil is necessary for their further progress. Fine, light, rich mould favors the vegetation and early progress of most seeds, though many, after they are a little advanced, flourish best in strong, heavy loam. A compost of peat or leaf-mould, fine sand, and well rotted manure, should be prepared, and if all the finer seeds are covered therewith, one great difficulty in growing fine vegetables on stiff soils will be removed, as well as their early maturity secured. Even in dry weather one can generally bring up seeds by digging and finely pulverizing the earth; then soaking it well with water that has been some time exposed to the air to raise its temperature; then sowing the seed in drills of the proper depth, and sifting over the bed a coat of this compost. In the case of large seeds, as corn, beans, etc., after the ground is prepared, only the hills or drills need to be thus soaked, and then covered with the compost.

Special directions for managing seeds requiring peculiar care will be given hereafter.

But the best management will be of no avail if one does not get the right seeds. It is not pleasant to see Early Yorks growing where one sowed what he bought for Drumheads. The way to avoid such mistakes is either to raise your own seeds and carefully label them, or to know of whom you buy. Your own eye in the case of many seeds will not assist you at all in discriminating.

Seed must not only be of the right sort, but true to that sort. Early York cabbage seed may be sown, or Scarlet radish seed; yet, from having been planted near to some

other varieties, the seed is crossed with them and the most valuable qualities of the variety lost. The cabbage may be late or long-legged, and not head at all, or the radish tough and misshapen.

PRESERVING SEED.—The very finest plants should be chosen for this purpose—that is, those most true to their kind and most perfect in shape and quality. In the cabbage, for instance, a small, short stem, well formed head with few loose leaves; in the turnip, large bulb, small neck, few, short and slender-stalked leaves, and solid flesh. In the radish, high color (unless white), small neck, few and short leaves. In the case of flowers, seed should be saved only from those most perfectly developed.

Great care should be taken to preserve the varieties unmixed, for, as just stated, if varieties of the same species, or very similar species, are planted near each other, they will cross and produce untrue seed. In this way, it is true, valuable varieties often originate, but the chances are that the produce will be worthless. There can be no cross between a cabbage and a carrot, because they are of totally different families, and there is no similarity; but all the varieties of cabbage will cross with each other, with Brussels sprouts, in short with all others of the genus *Brassica*. So of corn; in a few years the early varieties from the North, planted in Southern gardens, become so intermingled with the ordinary sorts, that the early character is lost. The difficulty of keeping seeds pure renders it advisable not to save seeds of two varieties of any species the same year, except in large gardens. Many kinds of seed it is more advantageous to buy of the regular seedsmen than to grow and save them at home. The finest seeds in the world are grown where an amateur makes one or two species of plants, like Truffant with Asters, a specialty, using every possible care for their improvement.

CROSSING AND HYBRIDIZING.—These terms are used by many as meaning the same thing; strictly speaking, *hybridizing* is when two distinct species are made to form a union, while *crossing* is where the same takes place with varieties of the same species. To make the matter plain, we must give the structure of the flower. The organs concerned in the production of the fruit or seed are the *stamens*, which correspond to the male organs, and the *pistil* or pistils, which are the female organs. These two are for the most part in one flower, and differ greatly in number in the different families. The simplest case is where both kinds are in one flower, as in Figure 79, which represents a flower of the flax split down, to show the arrangement of its parts. The central body is the pistil, and is surrounded by five stamens, which are shorter. It will be seen that each stamen is composed of two parts—a slender portion, the *filament*, which bears a two-lobed body, the *anther*, which produces a fine fertilizing powder, the *pollen*. The pistil has an enlarged base, the *ovary*, which contains the *ovules*, which are to become seeds; above this is usually a prolonged portion, the *style*. The styles may be one or several; in the case of the flax there are five, each one of which is surmounted by a *stigma*, that part which receives the fertilizing powder, or pollen.

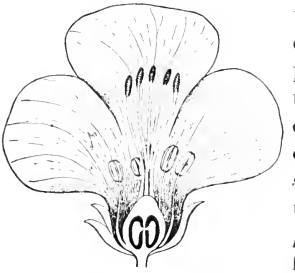


Fig. 79—Flax Flower.

Fig. 80—Stamens and Pistils.

The stamens and pistils are not always found together in the same flower. In Indian corn they are separated, but on the same plant the tassel containing the stamens

or male organs, while the silk and ear are the pistillate parts. Such plants are called *monoecious*. In other instances, as spinach, the flowers which contain the stamens are not found upon the same individual plant with those that bear the pistils. These are called *dioecious* plants.

Cross breeding, where both sexes are united in the same blossom, is accomplished by removing the stamens and dusting the pistil with the pollen of a different variety, a simple process; but from the resulting seed a new variety, partaking somewhat of the qualities of both parents, will be produced. Care is required in the process. A blossom must be selected not fully expanded, and all the anthers be cut out and removed. Protect the blossom with a loose bag of gauze to keep off the bees. As soon as the blossom is fully expanded, collect on a camel's-hair pencil the pollen from a full-blown flower of the variety selected for the male parent, and apply it to the stigma or point of the pistil. Success depends upon the careful extraction of the anthers before they are advanced enough to fertilize the pistil, the application of the pollen when in perfection—that is, in a powdery state, upon the stigma while still moist—and the prevention of natural fertilization from pollen carried by insects or by the wind. Cross breeding often takes place naturally. If different varieties of corn are planted near together, often three or four kinds and colors of grain will be found upon one ear from natural intermixture.

But there are limits to the power of crossing plants. Those between two varieties of the same species, as between two kinds of corn, or two varieties of the pear, are common enough, and these are fruitful and produce perfect seeds. In the same genera, also, certain nearly allied species are capable of fertilizing each other; the offspring in this case is called a hybrid, and does not always produce perfect seeds. Thus the different species of the

strawberry, also those of the gourd and melon family, readily intermix. So also do those of the rose. But no one has succeeded in crossing the apple with the pear, or the gooseberry with the currant, though in both cases they are species of the same genus. Still less will such totally different plants as oranges and pomegranates intermix.

Our flower gardens in modern times have been greatly enriched by cross breeding and hybridizing. Thus have originated a great number of new and beautiful roses, rhododendrons, azaleas, camellias, fuchsias, dahlias, etc., so beautiful in color and perfect in form and habit.

PROPAGATION BY DIVISION.—Every other mode of propagating plants, except by seed, whether it be by bulbs, tubers, runners, suckers, parting the roots, layers, cuttings, budding or grafting, is effected by a division of the plant to be increased.

BULBS.—Propagation by division, in the case of bulbs or tubers, is analogous to sowing seeds. The new bulbs may be separated when the leaves of the mother-plant decay. The onion, hyacinth, tulip, etc., are generally taken up and stored in a moderately dry, airy place, until it is the proper season for growth, and are thought to grow better in consequence of their surplus moisture being evaporated. The corms or bulbs of the crocus, thus treated, produce better plants and stronger flowers. Removal gives an opportunity for changing the soil before the bulbs are reset. There are, however, many scaly bulbs, as the lily, that are injured if long out of the ground, and if not planted again at the proper season, the strength of the plant is much diminished. Bulbs generally like a light, rich, sandy soil, well pulverized, and most bulbs and tubers require to be planted more deeply than seeds.

TUBERS may be taken up when mature, and kept until

the proper season for replanting. They may generally be cut into as many pieces as they have eyes, and each eye will produce a plant. The tubers of the Chinese yam have no visible buds, but if cut into pieces and planted, buds will push out from the wrinkles that appear upon its surface.

RUNNERS are thrown out by the strawberry and many other plants. They spring from the crown of the plant, deriving from it their nourishment, and at a greater or less distance from the parent plant throw out a bud above and small projections or rudiments of roots, which, in favorable conditions, strike into the soil and help to nourish the young plant above. The growing point of the runner extends to form another new plant beyond. Runners cannot well take root in dry weather, but in contact with moist soil the roots soon strike. To facilitate the rooting, the joint is often pegged down, or a small stone placed over it a little behind the bud, which preserves the earth in a moist condition as well as keeps the joint close to the soil. If it is desired to obtain as many plants as possible, do not permit the parent plant to waste its vigor in producing flowers and fruit, but cut off the flower stalks as they appear. If strong plants are desired, stop each runner after it has made one or two plants. The new plants, when well rooted, are ready for removal at the proper season.

SUCKERS.—These proceed either from the root or from the stem, or collar of the plant. *Root Suckers* are produced from those plants which send out stray horizontal roots, as the sucker is in fact a bud from one of these roots which has pushed its way through the soil and become a stem. As this stem generally forms fibrous roots of its own above the point of junction with the parent root, it may be slipped off and planted like a rooted cutting.

Root suckers are thrown up by some plants, like the

currant, close to the main stem; by others, like the plum and paper mulberry, at considerable distance. Raspberries, poplars, roses, lilacs, and many other shrubs and trees, are thus readily propagated, the offspring with the roots that properly belong to it being carefully separated from the parent and replanted in suitable soil. The roots of the parent plant should be injured as little as possible. Remove the soil, and if the sucker springs from a large root, detach a slice of it with the sucker instead of severing it. The supply of nourishment being diminished by separation from the parent plant, the head of the plant removed must be cut in, except in the case of coniferous plants, to prevent evaporation.

The great objection to planting suckers is, that plants grown from them have a much greater tendency to throw out suckers, and thereby become exceedingly annoying in gardens, by encroaching on other plants, than if propagated by other methods.

Stem Suckers spring from the stem of the old plant where its base is beneath the surface. Shoots originating at this point frequently strike root and become rooted suckers. In plants in which this natural tendency is not sufficiently strong, it may be increased by earthing them up well with good mould, which may be kept moist by mulching. The quince and other plants are propagated in this manner.

PROPAGATION BY SLIPS.—This is the mode in which many small undershrubs, like box, sage, rue and lavender, are increased. They are dug up in spring or fall, and the young shoots, with some portion of root attached, slipped off with the thumb and finger, and if small, they are planted a year in nursery rows. Many kinds of plants grow from slips of the young branches with little or no root attached. The number of young plants to be obtained by division can be increased in some cases by sprinkling

fine soil among them that the lower branches may strike root in it, or taking up the plant and resetting deeper than before. Box edging when overgrown, if taken up in spring, partly divided and replanted so that the base of each shoot is covered, can, after rooting, again be divided into as many plants as there were shoots. Stem suckers are often called slips.

PARTING THE ROOTS is the ordinary way of increasing herbaceous perennials with annual stems, such as phloxes, chrysanthemums, etc., which can be taken up in spring or autumn, and divided by hand, or with the trowel, knife or spade, into a number of plants with a portion of root to each.

PROPAGATION BY LAYERS.—A layer is a branch or shoot bent down into, and covered with, the soil, in order to make it take root. Meanwhile it is fed by the parent stock, with which its communication is, however, partially obstructed to make the returning sap form roots, instead of going back into the stock. With some plants a sufficient check is given by simply bending and properly covering it with earth; the branch is held in its place by hooked pegs until it takes root. But in general this is not enough. The most common way of obstructing the return flow of sap is when the shoot is bent into the earth to half cut it through near the bend, the free portion of the wound being called a tongue. This is kept open by a bit of twig, or piece of crock. Such layers are in fact cuttings, only partially separated from parent-plants. The incision is made through the bark at the base of a bud. The object of the gardener is to induce the layer to emit roots into the earth at the tongue. There are other modes of effecting this.

With this view, he twists the shoot half round, so as to injure the wood vessels; he heads it back so that only a bud or two appears above ground, and when much water-

ing is required, he places a handful of silver sand around the tongued part, then pressing the earth down with his foot, so as to secure the layer, he leaves it without further care. The intention of both tongueing and twisting is to prevent the return of the sap from the layer into the main stem, while a small portion is allowed to rise out of the latter into the former. The effect of this operation is to compel the returning sap to organize itself as roots, instead of passing downwards to form wood; the bending back is to assist this object, by preventing the expenditure of sap in the completion of leaves. The bud left on the tongue favors the emission of roots, as a tendency exists in nearly

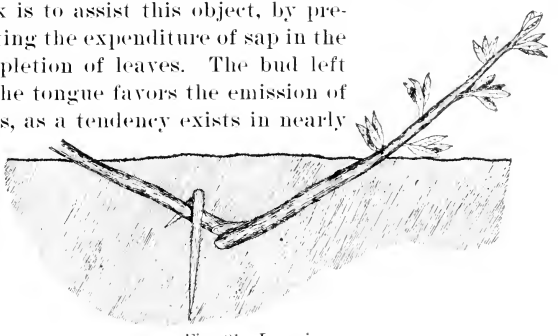


Fig. 81—Layering.

all plants to throw out roots at the joints, and the silver sand secures the drainage so necessary to cutting.

The old mode of forming the tongue, and the best, unless the shoot is brittle, is shown in the figure, where the tongue is shown upon the underside of the layer. "A plan," says the *Gardener's Monthly*, "which is now much in vogue with the best propagators, is to cut the tongue *on the upper surface*. On bending down into the soil, the tongue is then twisted on one side, and the young shoot intended to form the future plant may then be lifted up and bent towards the parent as rapidly as one pleases, without any danger of it snapping off. There is another advantage in this way of layering. It is often necessary,

in the stereotyped way, to place a chip or something between the tongue to keep it open. By this, the twisting of the tongue aside keeps it always separate from the old cut. Again, by this mode, very green shoots can be operated on—magnolias, for instance—in June, and plants may be got well rooted by fall, instead of waiting for the wood to ripen in August, when we have to wait for another year before our layer is sufficiently rooted to take from its parent. Another method of forming the tongue is to make the cut upon the side, as in Figure 81.

Instead of forming a tongue to make a shoot throw out roots, the branch may be split in the center for two inches, more or less according to its size, and the parts separated with a bit of wood. Roots will be thrown out along the edges of the split. The returning sap may also be arrested by ringing; in which case a ring of bark is removed from the branch for the purpose, or by a wire twisted tightly around it pinching the bark.

When the roots are thrown out naturally wherever a joint touches the earth, as in the verbena, the branches only require pegging down to make them form new plants. Where it is difficult to get the shoot to be layered down to the soil, a portion of the soil may be raised to the plant, as the Chinese gardeners practice in a pot, the earth in which should be kept steadily moist.

Another mode of layering is by insertion of the growing point in the soil. When the shoots of a raspberry or gooseberry are of some length and firmness, if the growing points are inserted in well-dug soil, they will form a nice bundle of roots and a good bud ready for transplanting in autumn. This is worthy of trial with many other plants.

The grape is best layered by digging a trench and laying therein a thrifty cane in the spring. Let remain until young shoots, three or four inches long, are formed; then

gently draw a little of the soil into the trench covering the parent cane, and as the shoots increase in strength, fill up the trench, and each young shoot will make a fine plant by autumn.

In general, the best season for layering is before the sap begins to rise in the spring, or, in the case of wood of the same season's growth, in the summer after June. A good time for roses is after the first bloom is over. Layered at this time, they will generally be fit to take up the ensuing winter, but most plants require twelve months, and some two years, before they will root. In nurseries the ground is prepared around each stool by digging and manuring, and the branches laid down neatly, so as to form a circle of rays around the stool, with the ends rising all around the circle to about the same height.

CUTTINGS.—A cutting is a part of a plant detached from the parent stock, which, placed in proper conditions, will emit roots and become in its turn a new plant. It may be a portion of the stem, the branches, or the root, and sometimes even a leaf.

In a cutting, as in a growing plant, two forces are in constant activity, those of absorption and of evaporation. Its life cannot be long continued, unless these correspond with each other. A cutting, from the lack of roots, absorbs feebly from the soil; hence evaporation must be diminished to correspond, and the base of the cutting must be in contact with a substance more or less humid. Evaporation is diminished by planting in a northern exposure, shading, the use of bell-glasses, etc. The more herbaceous or immature a cutting may be, the greater care is required to protect it from excessive evaporation.

Cuttings of hardy deciduous trees and shrubs should be taken off after the leaves fall, or before the sap rises in the spring. Those that strike readily in the open ground in mild climates may be planted out to form the callus,

and be ready to enter into growth with the opening spring. In more northern climates they may be prepared for planting, and stored in moistened moss or damp earth, and kept from frost. The callus will be forming, and they will be ready to plant in early spring. Generally, cuttings should not be taken when the sap is in full flow, as moisture is then rapidly evaporated and the cutting exhausted before roots are formed. They should be taken when the plant is dormant, or when a new shoot has been made with leaves so fully formed and matured as to be in the act of forming abundance of woody tissue.

In selecting cuttings, they should come from healthy plants, from shoots of average strength, well nourished, but not over vigorous, as the latter are more quickly exhausted when deprived of their usual supply of nourishment. Horizontal branches growing near the ground, especially those which recline upon it, have a greater tendency to throw out roots. Upright shoots from near the summit are generally, but not always, less likely to succeed. The willow and poplar strike freely from old wood, and trunks of considerable size, if planted, will emit roots, but of most trees the best plants are made from well-matured shoots of the current year's growth. In the case of hard-wooded plants that are hard to strike, it is a nice matter to select a portion of shoot in which the wood is neither too old and hard, from which roots will not be readily emitted, or too young and soft, as in this case they will damp off. Rose cuttings strike most readily when not quite fully matured. The proper state of firmness differs in different species. The age at which a cutting of any species will strike best or strike at all, is determined by experiment, but when once ascertained, it is invariably the same. The proper age of an untried species may be proximately determined from that of the most closely

related species in which it is known, and will often prove to be right if the species are nearly allied.

Some cuttings require little preparation. A willow may be sharpened and driven into the soil and will take root, and in some instances has done so, if planted bottom upwards. Currants and gooseberries, cut into suitable lengths, will emit roots not only from the callus, but from any part beneath the soil. Of these, as of cuttings of all deciduous trees, the buds on the part of the cutting beneath the soil must be removed before planting, or they will push and become shoots. Cuttings of which the leaves have fully performed their office, and the wood is ripened early in the season, if made and planted out in warm, moist soil, will form roots before winter, and be ready to push into vigorous growth in spring. Such cuttings, planted in August or early in September, are nearly a year in advance of spring-planted cuttings.

Cuttings of plants, difficult to strike, may have a ring of bark taken out just beneath a joint, at midsummer, which will cause a swelling of the branch above the ring. The branch is cut off in autumn at the base of the swelling, the top shortened, and it is planted as a cutting, or it is buried in the soil for the swelling to soften, and planted early in the spring. With plants that are not very free to strike, it is from the joints only that roots can be expected to grow; hence, in making cuttings, the shoot is divided just below a joint, and it is considered best to choose a joint between the young wood and that of the previous season. The cut should be quite smooth, for if the shoot be bruised, the returning sap will not be able to reach the wound in sufficient quantity to make it heal over and form the callus quickly, and the cutting will be likely to fail. When the callus is properly formed, there is little difficulty in striking cuttings. To form the callus they may be mixed with damp sphagnum moss, or old

tan, and kept in a dark cellar until about to push roots. Cuttings may be placed loosely in a common preserving bottle, with a wet sponge, the water drained out, and the bottle stopped with a cork which has a half-inch hole in the top to admit air. This may be kept where the atmosphere ranges from temperate to summer heat, and the callus will form very quickly.

Preparation.—The way to prepare cuttings for planting is best shown by an illustration. Figure 82 *A* shows a cutting formed from a lateral shoot, and has been cut off from the main branch with a *heel* attached. Such cuttings are sometimes torn out and the bottom smoothed with a sharp knife, so as to present a larger surface for the absorption of moisture. At *B* is a deciduous, woody cutting, as commonly prepared. At *C* is shown a mode in which grape cuttings are sometimes prepared; the two extremities of the fragment of branch at the base are furnished with buds. This is a mode which greatly favors the emission of roots. Figure 83 is a cutting of a geranium ready for insertion in the soil. In this case the lower leaves have been removed; they should be clipped but very little farther from the base than where the cutting is to be inserted in the soil. The leaves being kept near the moist surface, do not evaporate as rapidly as when elevated much above. The petiole (or leaf stalk) should be

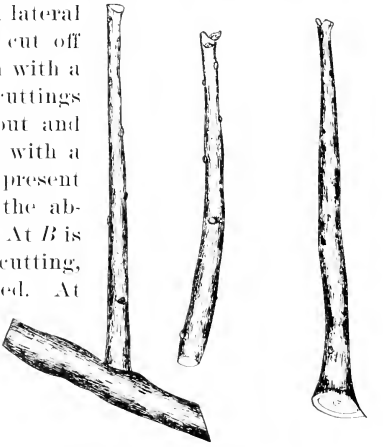


Fig. 82—Different Forms of Cuttings.

cut off as close to the stem as can be done without injury to the bark. If much of it is left and buried in the soil, it is apt to rot and produce decay in the cutting itself. If an old leaf or two is left, it will elaborate more sap for the formation of new roots than the very young ones. Cuttings of succulent plants, like the cacti, geranium, etc., require to dry a little that the wound may heal over before inserting in the soil.

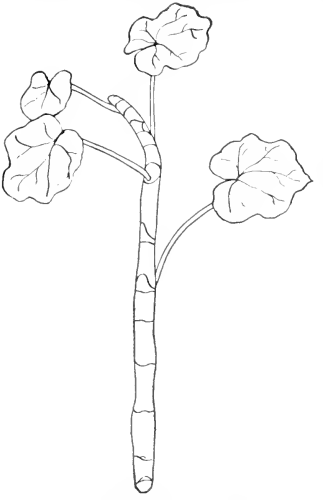


Fig. 83—Geranium Cutting.

The grape is often propagated from a single eye—a mode now very much in use for new varieties. These cuttings, shaped in one of the forms shown in Figure 84, are planted in small pots under glass, the surface kept damp, and bottom heat applied. They soon take, and form the best vines.

The substances in which cuttings are struck are various. Many plants, as chrysanthemums, currants, etc., will root in common garden soil. Powdered charcoal, brick dust, and even pure water are employed, but the most useful substance is pure silver sand, white, clean and fine. Sea sand must not be used, unless all saline matter is washed out. Sand contains little food for plants, and they need little until the roots are formed, but it is free from matters which induce decay. It is porous and gives ready passage for the young rootlets, and, being fine, retains moisture by capillary attraction.

Some plants will strike roots if the ends of the cuttings are kept in water of the proper temperature. Bottles, vials, and jars are used to hold the water, but as light is rather an obstacle to the ready formation of roots, if the vessel is transparent it should be shaded. As soon as the roots begin to appear, the cuttings should be taken from the water and planted in fine soil, which must be kept moist, and the plants carefully shaded until they take fresh root.

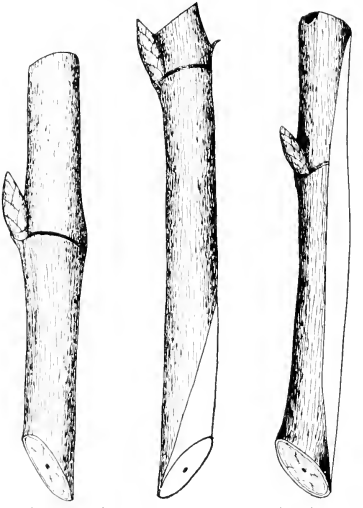


Fig. 84—Three Forms of Grape Cuttings.

Insertion.—Cuttings of hardy plants that strike readily in the open air are sometimes inserted with a dibble, but it is better to cut off by a line a straight edge in the dug soil, and place the prepared cuttings against it, pressing the soil closely around them. These are usually set perpendicularly. If the cuttings are long, they can be set in a sloping direction so as to be within reach of atmospheric influences. If not herbaceous, they should be inserted so deep that but two buds will be above the surface, and in the vine but one. Herbaceous cuttings are inserted less deeply.

When small cuttings are planted under glass, a pointed stick of proper size is used. Many kinds may be planted all over the surface of the spot, but most do better when inserted near the sides or bottom of the pot, and take root

more readily. The soil in all cases about a cutting must be closely pressed against its extremity, or it will never strike root.

Temperature.—Many cuttings that rarely strike root in the open ground do so freely when moist bottom heat is applied. When the soil is but slightly warmer than the air, the roots grow in proportion to the top, but if the soil is constantly warmer, the disposition to produce roots will be greater than to produce tops. In striking cuttings the object is to produce roots, and then leaves will follow; hence the temperature of the soil should be somewhat higher than that in which the species naturally commences growth, in order to secure good roots, without which there can be no vigorous leaf-buds. This stimulus should be applied to soft-wood plants almost immediately; others may require some delay until the callus is formed. Deciduous shrubs in a dormant state should at first be placed in a temperature very little higher than would excite and swell their buds on the parent tree. Increase the bottom heat gradually, keeping the soil warmer than the atmosphere. From 50° to 60° is about right for the soil at this period, and about 50° for the atmosphere for hardy and greenhouse plants, increasing the bottom heat to 65° or 70° very gradually, when the roots commence growth. Care should be taken to prevent its falling lower until rooted, when it may gradually be lessened until but little above that of the air of the place in which they are growing.

Moisture.—The cutting, while rooting, must be kept in a suitable state of moisture. In vine cuttings, and others, nearly covered with soil, all that is required is to keep them in such an equable state of moisture that they can have as much as they can appropriate, and no more. A cutting requires more moisture in the soil than a rooted plant.

To recapitulate: The principal points to be attended to in making cuttings are—to cut off the shoot at a joint, without harming the stem; to select shoots with well matured buds; to fix the end which is to send out roots firmly in the soil; to keep up an equable degree of heat and moisture; to cut off part of the leaves and shade the whole, to prevent evaporation, without too much excluding light, of which a portion is needed to stimulate the cutting into growth; to keep the soil moist but not too damp. It is well to transplant them into small pots, supplied with water regularly and moderately as soon as they begin to grow. Cuttings of slow-growing plants are those most liable to fail. An excess of heat, cold air, water, and light are all injurious to tender cuttings.

Pipings.—Cuttings of plants with tubular stems, like the pink, are called pipings. The upper part of a shoot, when nearly done growing, is pulled out of the socket close above a joint, leaving the part pulled out with a pipelike termination. These pipings usually have their leaves or "grass" trimmed a little, and are struck in sand about an inch apart, with a bell-glass closely fixed over them. If well watered at first, they will not require it again for some time. They are planted about three-quarters of an inch deep, and treated like other herbaceous cuttings. Under a north wall they succeed finely.

Root Cuttings.—Many shrubs and plants are in this way most easily increased. Pyrus Japonica, blackberry, rose, apple, pear, quince, elm, mulberry, osage orange, etc., if their roots are cut in pieces some three to nine inches long, and planted vertically with the end nearest the stem up, and covered slightly with earth, will soon form buds and throw up shoots. Many herbaceous plants, as sea-kale, horseradish, Japan anemone, etc., are thus increased. Of these the cuttings are made short, and, except the second named, planted horizontally.

CHAPTER X.

BUDDING AND GRAFTING.

BUDDING is the art of making a bud unite to the stem or branch of another tree independently of its parent. It is a cutting with a single eye inserted in another tree called a stock, instead of in the ground. The operation may be performed at any time after the buds of the new wood are sufficiently matured. These must be perfectly developed, which is seldom the case until the shoot has temporarily ceased to lengthen, which is indicated by the perfect formation of the terminal bud. If the buds are desired very early, their maturity may be hastened by pinching the tops of the shoots.

The ordinary time for budding, north of Virginia, is from the middle of July to the middle of September, and the buds in general remain dormant until spring. Roses are, however, budded earlier, and allowed to make some growth. In the South, buds are inserted at any time when the bark will rise, from June to October. Those put in early will make a fine growth before autumn in favorable seasons. A very necessary condition to successful budding is that the bark rise freely from the stock, and this must be in a thrifty, growing state, as when pushing into new growth a day or two after a fine rain. If the weather is too cold or the soil too dry, the bark will not rise. Such trees as make most of their growth early in the season must be budded before they cease to grow. Young shoots, when the buds are in a proper state, are cut below the lowest plump bud. If to be budded immediately, all the leaf is cut off, except the leaf stem, which is left for convenience of inserting, and in order to attract the sap into the buds. If the buds are to be preserved any time,

the whole leaf with half of the leaf stem is removed to prevent evaporation. If this is done as soon as they are cut, they may be preserved several days in a closely covered tin box, or tightly corked preserve jar, if in a cool place, and indeed, if the wood is well ripened, though the footstalk of the leaf will drop, the bud will be in perfect condition some weeks. No water need be given if there are several cuttings in the box, as the air becomes sufficiently saturated with moisture from the cuttings themselves.

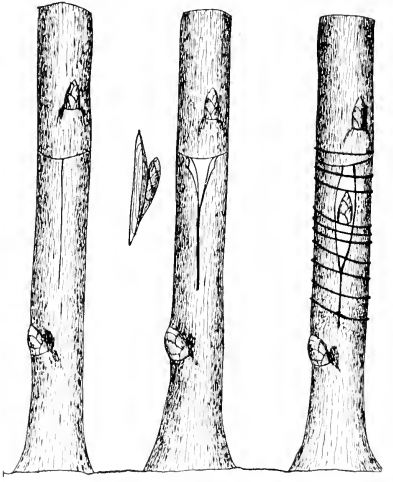


Fig. 85—Budding.

The strings used for tying are taken from bass mats, which should be wetted before use, until perfectly pliable. Better strings are made of white woollen yarn, as they are more elastic, and the color reflects the heat. The pruning and budding knives are the only implements required for the operation. The condition of the budding knife is of importance to success. It should be made thin, and the edge kept perfectly smooth and keen. The mode in which budding is performed is shown in Figure 85.

Having the implements, stocks, and buds in the proper condition, take the shoot in the left hand, and the budding knife in the right. Insert the edge of the knife in the shoot, half an inch above the bud to be taken off.

The bud is taken off with a drawing cut, parallel with the shoot, removing the bark and the bud attached, with a slight portion of the wood beneath the bud, half an inch above, and three-fourths of an inch below. The English remove this slight portion of the wood, taking great care not to injure the root of the bud; but it does not succeed so well in this climate as if a small portion of wood be left directly under the bud. Select, then, a small portion of the stock, smooth and free from branches, and make two cuts through the bark, one across the end of the other in the shape of a T, as in the figure. Then raise the bark on the two edges of the perpendicular cut with the smooth ivory haft of the budding knife; insert the bud gently beneath the parts raised, not forcing it down like a wedge so as to rub off the cambium of the stock, but pressing very little against the stock until so fully inserted that its own cambium can be applied directly to that of the stock where it is to remain; cut off the top of the bark attached to the bud square, that it may fit the cut across the stock; then wind the bass pretty tightly about the stock, commencing below the end of the bud, and pass it closely around up to the bud. The shield should here be firmly pressed, that the base of the bud may closely rest upon the alburnum; bring the tie pretty close to the under side of the bud, making the next turn wider, so that the point of the bud and the leaf stalk may be seen between the turns of the tie; continue binding closely until the cross incision is covered, then fasten with a knot. Cover every part of the incision, except the bud and leaf stalk attached, which should remain uncovered. Do not tie it so tightly as to cut into the bark, but so as to exert upon it a moderate pressure. The bud is put upon the north side of the stock, when practicable, and when not, a little paper cap may be tied to the stock, to project over the bud, so as to admit the light, but exclude

the direct rays of the sun. The success of the operation depends on its being performed rapidly, and with fresh, healthy buds; clean, smooth cuts; the bark rising cleanly and freely from the wood; the exact fit of the bud to the incision; and close, secure tying, to exclude the air and water. If the operation is performed in moist weather, and the bark of the bud is joined closely to the wood of the stock, success is almost certain. If the stocks are in a proper state, the upper edges only of the slit need be raised with the haft, and the bud being gently pushed to its place, will raise the bark smoothly before it, and the insertion be more firm than if the bark had been entirely raised with the haft. It is an operation requiring much exactness, but may be done in one minute; the point where a beginner will most likely fail is in the proper removal of the bud.

As soon as the bud has taken, the ligature may be loosened, and should be entirely removed when it begins to cut into the bark. If the leaf stalk, after a few days, drops off, it indicates the bud has taken; if it withers or adheres, the bud is likely to be dead or dying. The buds must be frequently examined, and the ties loosened, if becoming too tight, as they will in growing stocks. If it is desired to start the bud into immediate growth, soon after it has evidently taken, the stock may be shortened to within ten or twelve inches of the bud, and all shoots rubbed off as they appear, except that from the inserted bud. When this has grown three or four inches, the stock is cut off again near the budded shoot, and when this has grown some inches, the stock is cut off close to its base. When it is desired that the bud should remain dormant, cutting back the stock is delayed until just before the flow of sap starts in spring. Buds that are not permitted to push until spring soon overtake the others in growth.

Budding is the most rapid mode of increasing rare

varieties, of which every bud is almost sure to make a good plant if the operation is quickly and skillfully performed. It is the easiest method of propagating apples, pears, and most other fruit trees. In the case of peaches it is almost universally applied, and also with those roses that will not succeed readily from cuttings. Budding and grafting can be performed only upon plants of the same, or nearly related, species. Thus a peach can be budded on a plum, as they are both stone fruits, and belong to the same natural group of plants, but no art could make the peach flourish on the apple or pear as a stock.

GRAFTING.—This differs from budding in its being the transfer of a shoot, with several buds upon it, from one tree to another, instead of merely employing a single bud. It is performed by bringing portions of two growing shoots together, so that the soft wood of the two may unite together. The shoot to be transferred is called the scion, and the tree which is to receive it is called the stock. The stocks are of all ages and sizes, but they must be sound and healthy. The scions employed are generally shoots of the preceding year's growth, which may be cut at any time after the leaves fall, and may be buried in a *dry soil*, with the upper extremities slightly projecting on the north of a wall. They must be protected from heavy rains, or the buds will start too early. Amateurs can best keep all they wish in a corked preserve jar, or a tin box, or closely covered bucket. Examine them occasionally, and if too much moisture is present, leave the cover off a few hours. The drier the better, if they do not begin to shrivel. Keep in a cool place.

Scions of healthy, close-jointed wood should always be chosen. If they are to be sent to a distance, those of rather large size and close joints should be selected, enveloped in a little thin paper slightly dampened, and the whole covered tightly with oiled silk. In this way

they will go a thousand miles in perfect safety. The butt and extremities of scions should both be rejected. The tools required are, a grafting knife, saw, and chisel; but, for whip grafting, the knife only is employed. Two kinds should be used, one to prune and pare the stock, and the other to prepare the graft.

GRAFTING WAX.—A composition of very good quality is made of four parts rosin, two of beeswax, and one of tallow. Melt it altogether, turn it into cold water, and work and pull it thoroughly until it turns whitish; just as children do molasses candy. A wax for cold weather will work better with a little less rosin, and in warm with a little more. The stiffness of the wax is increased or diminished by employing less or more of tallow. In cold weather keep the composition in warm water, and in warm in cold water. In putting it on, the hands must be slightly greased, to keep it from sticking to them, but in operating grease the scion and stock as little as possible.

In applying the wax, be careful to cover the scion on the sides and the cleft in the stock, forming a cap over the top, and pressing it closely and tightly around the graft, so as to cover every crack, and carefully to exclude the air and water. More convenient than the wax itself, especially for whip grafting, is cloth saturated in wax that has been made softer by using more tallow and beeswax and less rosin. Take any thin, half-worn calico or muslin, tear it into narrow strips, roll them loosely into small balls, and soak them in the hot composition until every pore is filled. When wished for use, it is unwound from the balls, and torn into smaller strips, of the proper length and breadth required by the size of the stock. These strips, wound two or three times around the stock and graft, secures it perfectly.

MODES AND TIME OF GRAFTING.—The modes of graft-

ing most usually practiced are whip and cleft grafting, and they are practiced on the stem and branches, or the roots of trees. Root grafting can be performed at any time in this climate, or from the fall of the leaf until the buds begin to open. The peach, grafted in this way early in the season, succeeds perfectly at the South, but generally fails north of Virginia. Stone fruits of all kinds must be grafted earlier than apples, pears, etc., as their sap seems to lose all agglutinating properties after its first flow.

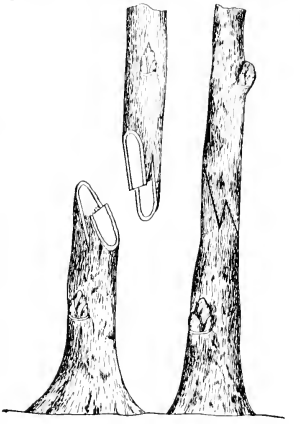


Fig. 86. Fig. 87.
Splice Grafting.

Graft them just as the buds are about to swell, but for most other species the best time for grafting, except in the root, where the scion will be protected by the earth covering it, is while the buds are swelling in the spring. If put in before that time the alternate freezing and thawing to which they are exposed often destroys the vitality of the graft. Apples, pears, etc., may be grafted until they blossom, if the scions are kept perfectly fresh, and have not started. Grafting succeeds perfectly well just before the second growth, early in August, if the sap is thrown into the graft, by rubbing off the other shoots as they appear; but it is just as well to wait until spring, there being no gain in the growth of the graft over those put in at the usual season.

WHIP OR SPLICE GRAFTING.—This mode is applicable to all small stocks, and succeeds best where the scion and stock are exactly the same size. Both stock and scion

are cut off with a sloping cut about an inch and a half long on each, so as to match precisely, if of the same size; or, if not, at least on one side. A tongue is then made on each by slitting the scion upward, and the stock downward. The tongue of each is fitted into the slit of the other, thus holding the scion firmly in its place. Bind it closely with the cloth covered with the composition. The engravings (Figures 86 and 87) show the different steps of the operation. It is the neatest, most expeditious, and most successful mode of grafting, where the stocks are of the proper size. Stocks, three-fourths of an inch in diameter, or even an inch, may be grafted in this way, but for inch stocks cleft grafting is preferable.

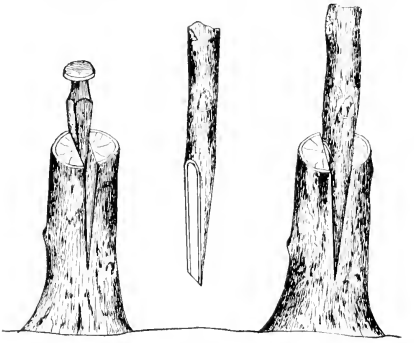


Fig. 88. Fig. 89. Fig. 90.

Splice Grafting.

Cleft Grafting is the more common mode. It may be practiced on large or small stocks, but for the latter whip grafting only should be employed. The top of the stock is cut off carefully with a fine saw, and pared smoothly with a sharp knife. The stock is then split with the grafting tool, and held open with the chisel of the same (Figure 88). A common knife will answer for splitting, and the split may be kept open for insertion with a wooden wedge or a large nail of which the point has been ground down to a wedge shape. Sharpen the lower part of the scion into a smooth wedge, one and a half inches long, more or less, according to its size, and that of

the split in the stock. The exterior side of the scion when sharpened should be slightly thicker than the other, that it may be sure to make a close fit there (Figure 89). Let the scion have two or more buds, of which one should be on the wedge and inserted just below the top of the stock (Figure 90). This often grows when the others fail. The main point is that the inside bark of the scion and that of the stock should exactly correspond, and meet at their edges at least in one place. To effect this, it is usual to set the scion so that its upper extremity falls a little without the line made by the continuation of the stock on the side in which it is inserted. It is better, as in Figure 91, to set it a little within or towards the heart of the stock, and the base of the scion a little out, and when the scion and stock cross each other, a meeting of the edges will be certain, and even a novice will thus succeed. One or two scions are set in the stock according to its size; the wedge is then withdrawn, and the whole carefully covered with the composition so as to exclude all air and moisture.

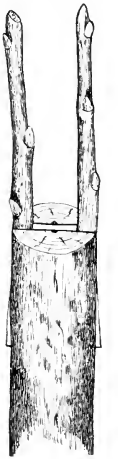


Fig. 91. Root Grafting.

Root Grafting.—Both the whip and cleft modes are successfully applied in root grafting, but splice grafting is more generally in use. In root grafting fruit trees, the best stocks for the purpose are seedlings, which are cut off at the collar and grafts inserted in one or the other of these modes, according to the size of the stock. If such stocks cannot be got, roots of thrifty trees may be employed, but they are more apt to produce diseased trees. This work can be performed at any leisure time during the winter, and when the winters are mild and open, they should be set

out in the open ground at once, and covered with soil about an inch above the point of junction.

In colder latitudes they are packed closely in small boxes with sandy earth among the roots, and kept in a cool cellar until they can be planted in spring. In root grafting, either waxed cloth or twine is used to hold the scions in place.

Fig. 92—Inarching or Grafting by Approach.

In grafting, as in budding, always have sharp instruments; make the cuts clean and smooth; bring the inner bark—that is, the active young parts—of stock and scion in close contact by a permanent pressure of the stock upon its scion; the top of the scion should be cut off next to a bud, and there should be a bud just beneath the shoulder where it unites with the stock; every portion of the wound should be perfectly covered with the composition, and the stock and scion must correspond, not only in their nature, but in their habits of growth.

INARCHING, OR GRAFTING BY APPROACH.—This mode is practiced with Camellias and Magnolias. A branch is bent and partly cut through, as in Figure 92, and the heel thus formed is slipped into a slit made downward in the stock to receive it; the parts are then made to meet as exactly as possible, and are bound with bass strings, as in Figure 93, and covered with grafting clay, or with the composition. In five or six months the union is complete, and the inarched plant may be separated from its parent, which is done with a sharp knife so as to leave a clean cut. The head of the stock, if not removed before, is then cut away, and the plant is ready for removal.

There are several other modes of budding and grafting, but the above are most useful and commonly practiced.

The *advantages* of these operations are the rapidity with which a valuable kind may be propagated which will not grow from seed or cuttings—trees of worthless fruit may be changed into more valuable varieties; seedlings can be brought into early bearing; foreign, tender fruits may be rendered hardier on hardy, native stocks; a kind of fruit may be grown in a soil not congenial to it, as the pear by grafting on the quince; several varieties of fruit may be grown upon the same tree; and, finally, by grafting on dwarf-growing stocks the trees may be so dwarfed as to afford many ripening in succession within the limits of a small garden.

Fig. 93.

Experience shows that the graft and stock mutually influence each other. The effect of the stock upon the graft in improving its product is evident in such pears as succeed on the quince, their size and flavor being much improved. The graft in turn affects the stock, increasing or diminishing its vigor. The Newtown Pippin will roughen the bark of any other apple stock. A Collins pear, grafted upon the branches of another variety, is very likely to cause the death of the whole tree.

CHAPTER XI.

PRUNING AND TRAINING.

PRUNING.—This operation is generally performed more at random than any other in gardening, yet is one of the most important and most delicate. Not even a twig should be removed from a tree without some definite object. This work above all others requires care, knowledge, and judgment, and should never be left to ignorant operators. In their hands the results can hardly fail to be injurious, but performed by those who base their practice on the laws of vegetation, it contributes to ensure a regular production of beautiful and perfect fruit, and still more to prolong the life and fruitfulness of trees.

The benefits of skillful pruning, as stated by Du Breuil, are:

1. It permits one to impose upon its subject a form corresponding with the place it is designed to occupy. Thus to standard fruit trees is given the pyramidal form, or that of the vase Trees thus managed produce larger and more abundant fruits than those left to grow at random, and occupy less space. Trees upon an espalier or wall, and vines upon a trellis, are made to develop their wood with symmetry and regularity, and occupy usefully the whole surface they were designed to cover.

2. By pruning, all the main branches of the tree are furnished with fruit-bearing branches duly exposed to air and light in their whole extent. An unpruned peach tree will produce fruit only at the extremity of each branch, but by pruning, all parts of the tree are made fruitful.

3. By pruning, fructification is made more equal. By suppressing each year the superabundant flower-buds,

and thinning the branches themselves, one preserves for the formation of new flower-buds for the following year the sap which would have been absorbed by the parts removed.

4. Finally, pruning renders the fruit larger, and of better quality. A large part of those nourishing fluids which would have supplied the suppressed parts is turned to the benefit of the fruit on the remaining branches.

Lindley adds that the time in which a fruit ripens may be changed by skillful pruning. If raspberry canes are cut down to three eyes in the spring, a late summer or autumn crop will be produced. By removing the flower-buds of remontant roses, fine autumn blooms are obtained.

TIME FOR PRUNING.—Pruning is performed at two periods during the year. Winter pruning is that given to trees while vegetation is in repose, and summer pruning includes all that a tree or plant receives in its stages of active growth.

WINTER PRUNING.—This may be performed at the South directly after the fall of the leaf, and in mild weather through the winter months, until vegetation is about to commence; at the North, from the time the severe frosts are over until the sap begins to move—that is, in February and March. If pruned before the heavy frosts, the cut, being exposed to their severity, does not heal readily and the terminal bud is often destroyed. Pruning must not be undertaken while the branches are frozen, as the wood cuts with great difficulty, and the wounds are torn and commonly heal badly, and the nearest bud generally perishes. If delayed until the shoots begin to start, all the sap from the roots that has been absorbed by the parts of the tree cut off is lost. A great many of the expanding leaf and flower-buds will be

broken off, and finally the sap, in full flow, pours from the wounds and the tree is greatly weakened thereby.

Pruned at the proper season, the tree throws all its force upon the remaining buds, developing those which would else be dormant. Where, however, a tree is too vigorous to fruit well, a late spring pruning, when the shoots begin to lengthen, will check its vigor and cause the formation of fruit buds.

The vine, currant, and gooseberry may be pruned at any time between the suspension of growths and the first flow of sap. In general, it is best to prune plants in the order in which vegetation commences; first apricots, then peaches, just as their buds begin to swell, plums and cherries, then pears and apples. Stone fruits should be lightly pruned, as they are apt to be injured by the issue of gum from the wounds.

SUMMER PRUNING.—Shoots may be removed at any time, if the tree seems to be throwing its strength in a wrong direction. This is better accomplished by disbudding—that is, removing those buds which would produce unnecessary shoots, or pinching the extremities of those shoots which are making too much wood.

Pinching, or removing the growing point with the finger and thumb, is the most essential operation in the summer management, both of fruit trees and ornamental plants. The tendency of the sap is to the growing points, and especially to those more elevated and exposed to the light. The upper buds, if the tree or plant is near to and shaded by others, are the only ones to develop, and, consequently, it shoots upward rapidly, while the stem is not proportionally developed, and few side branches are thrown out. Such a tree must not only be cut back severely at the winter pruning so as to shorten the leader to perhaps one-third of its growth, but it needs looking to in summer, or it will push upward as strongly as before.

To strengthen its side branches, then, it is necessary to pinch in early, while they are in active growth, the leader or any other shoot that is evidently receiving an undue amount of sap. This operation checks the flow of sap to that point, and directs it to where it is more needed. When a side shoot shows a disposition to outgrow the leader, the defect is remedied by pinching, with no loss of wood or growth to the tree. Pyramidal forms can only be secured in this way by summer pinching, keeping the lower limbs always the longest. In the same way early bearing is promoted, for the check given to the growing point concentrates the sap, and, unless the shoots again start into growth, it is likely to form fruit buds. Bushy specimen plants in the greenhouse and flower garden are not to be seen in plants left to themselves. The stems are soon naked, and, if cut back, they soon grow up as bad as before. If the leading and other dominant shoots are pinched back, leaving the side shoots unchecked until ripe, when they may be cut back a little to make them branch, they will be as healthy and full of bloom as those at the upper part of the plant. Pinching should be performed at once as soon as a shoot shows itself out of proportion. Further directions as to the summer management of particular trees and plants will be given hereafter.

IMPLEMENTS.—The implements required in pruning are the common pruning knife, a small saw with very fine teeth, a socket chisel two or three inches wide, with a long handle and a pair each of large pruning shears, pruning scissors, and pole pruning shears; these should divide the branch with a clean, smooth cut, and not bruise it on the side next the stem.

MODE OF OPERATING UPON THE BRANCHES.—They should be so cut that they will heal kindly. If it was desired to cut off a branch as at Figure 94, it is cut as near

to the bud as possible, without injury to it. The knife is entered directly opposite to the base of the bud, and comes out even with the point of the bud. In this way the bud will not suffer, and the cut quickly heals. In Figure 95 the cut is so far above the bud that the shoot will die down to near the bud, and require to be again cut off that it may heal over. If the cut is made, commencing too far below the bud, as at Figure 96, the bud is badly nourished and will be less vigorous, and perhaps perish. In cutting off a branch it should not be cut so close to the stem as to wound it, nor should the cut be larger than the base of the branch, or so long as to leave a snag to decay slowly for years, if indeed it does not send out new vigorous shoots again requiring removal.

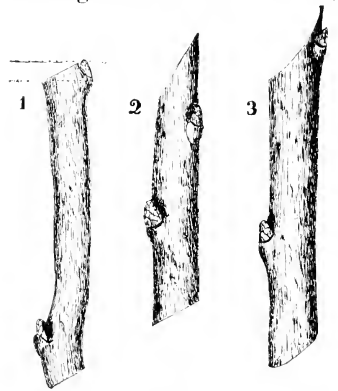


Fig. 94. Fig. 95. Fig. 96.
Operating on Branches.

Considered mechanically, the great art is to make a clean, smooth cut, so as to leave the bark in a healthy state to cover the wound, and to prune so near a bud as to leave no dead wood. Hence, if the branch be removed with the saw, the cut must be smoothed over with the knife. In cutting off large branches, the wound should be covered with grafting wax, or painted over with Mr. Downing's preparation of shellac dissolved in alcohol, in order to exclude the air.

General Principles of Pruning.—The secret of pruning judiciously consists in, first, "Calculating intelligently the proportion one ought to establish between the

branches with fruit and those with none, and which serve only to nourish the tree; second, in establishing an equilibrium among the parts of the tree, so that neither side nor its leader may grow out of proportion so as to weaken the other side or the base by drawing to itself all the sap."

Pruning is most commonly intended either to *improve* the *form* of the tree by directing the growth from one part to another; to *renew* the *growth* of stunted trees; to *induce* or *diminish fruitfulness;* to *remove diseased* or decaying *branches;* and in cases of transplanting, to *proportion* the *head* to the *roots.*

In *pruning to improve the form of the tree*, whether fruit trees, or ornamental trees in pleasure grounds, the object is to preserve its natural shape, so that it may be an agreeable object on the lawn, or when combined with others in a group. Lawn trees should never have the stems trimmed up to bare poles, but the branches should proceed from near the ground, so that when covered with foliage they will nearly sweep the surface, and be one mass of green from the base to the top. So in all kinds of fruit trees, the branches should be allowed to proceed from the trunk about a foot and a half from the ground. Such trunks are screened from our burning sun, and are much more healthy and fruitful than those with naked stems five or six feet high. Every tree growing naturally has its trunk sheltered from the sun. If it grow in the open ground, this is accomplished by its own branches, while in the forest all the trunks are sheltered by the canopy of foliage above. If one part of the tree is disposed to outgrow another, and thus destroy the balance, it may be shortened in winter, and the shoots pinched off the next summer, until the sap is thrown in the right direction into weaker branches that were left entire, and the balance is restored. When it is desired that new shoots of a branch should take an *upright direction*, prune

to an *inside bud*. If you wish an *open, spreading top*, prune to an *outside bud* of the branch. If the branches be cut at an inside bud, as at *A* (Figure 97), the growth from the upper buds will be as in Figure 98, but if the cut at an outside bud, *B* (Figure 97), the new branches will spread apart, as shown in Figure 99. To make a stem grow erect, in the annual cutting back which young trees require,

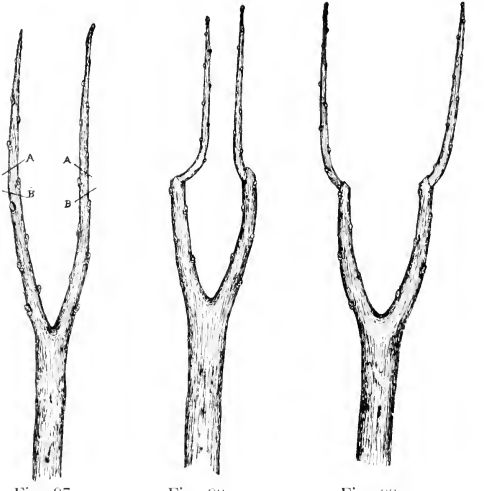


Fig. 97. Fig. 98. Fig. 99.

Pruning to Improve Form.

select the bud intended for a leader on opposite sides each successive year, and the tree will grow upright. Selecting it two or three years on the same side will cause the trunk to incline in that direction. Symmetrical growth is not only agreable to the eye, but it assists in maintaining the equilibrium of vegetation, preventing the sap from being drawn more to one side than the other.

PRUNING TO RENEW THE GROWTH.—When a tree has

stopped growing, remaining stationary, it often happens that if it is cut back in winter to a few buds, the whole force of the sap being made to act on these few buds, vigorous young shoots will be produced, and, these sending down new woody matter to the stem, new roots are formed, and the whole tree is renewed. In young trees where the growth has not been checked, an annual cutting back of the new growth is likewise necessary, and will strengthen the branches on the lower parts of the tree, and thicken up the trunk, enabling it to maintain an erect position.

PRUNING TO REDUCE OR DIMINISH FRUITFULNESS.—Everything that is favorable to rapid, vigorous growth, is generally unfavorable to the immediate production of fruit. Hence prunning, to induce fruitfulness, is performed after vegetation has commenced. If a tree be severely pruned immediately after its leaves have put forth, it is so checked as to be unable to make a vigorous growth the same season, the circulation of the sap is impeded, and the young shoots that would have made wood branches, had the growth been unchecked, will become fruit spurs. Pinching the extremities is, however, the usual mode of pruning to induce fruitfulness. The same result is produced by pruning the roots, which also lessens the dimensions the trees would otherwise obtain, by diminishing the quantity of food they receive from the soil.

PRUNING AT TRANSPLANTING.—At this time all bruised and broken roots and branches should be removed with a sharp knife. When trees are taken from the ground, a greater or less portion of the roots is destroyed or injured, and the natural balance between the root and top is destroyed, and the tree in this condition will either die or make a slow growth. In England, the climate is so moist that trees may be removed and leave nearly all the

branches as they were; but under the hot suns and strong winds of an American climate, a vigorous shortening in is requisite.

As horticultural theorists strongly insisted that pruning at transplanting was injurious, J. J. Thomas, Esq., author of the Fruit Culturist, has settled the question by direct experiment. Of six apricots, two years from the bud, about seven feet high, five were cut back and one left uncut at transplanting. The most vigorous of the five made 21 shoots, from 6 to 21 inches long. The weakest had 9 shoots 6 to 7 inches long, not counting the shoots less than 6 inches in length. The unpruned tree had on 7 shoots, all less than 2 inches, and not one-twentieth part of the amount of foliage to be found on other trees. Experiments upon cherry trees, planted at the same time, equally showed the necessity of pruning at transplanting. Trees unpruned when transplanted are so checked that it requires years to restore them. In a southern climate they must be more severely cut back, when planted out, than in that of Macedon, New York, where the experiments were made.

It matters very little how closely we prune the top of the trees; only have good roots, and a single season's growth will restore the balance. Do not leave more than one or two buds to a branch of the previous year's growth if the tree is of much size at the time of transplanting. Coniferous trees, as the pines, firs, etc., are exceptions, for if cut back at planting, the leader being lost, the form of the tree is difficult to restore. Hence those only of this class should be planted which have been taken up and reset annually in the nursery until a mass of fibrous roots has been formed. These must be protected from the air until the tree is reset. Broad-leaved evergreens, like English laurels, evergreen oaks, may be cut back and a portion of the leaves removed to lessen evaporation, with

the same advantage as deciduous trees. Indeed, many of the broad-leaved evergreens, taken from the woods, cannot be transplanted with any success, unless nearly all the top is removed. Nursery-raised trees are taken up and reset so often that they can be replanted safely without cutting in so severely.

M. Du Breuil, from whose work we have already drawn, bases the whole theory of pruning fruit trees upon the following six general principles, which, in giving, we condense:

I.—*The vigor of a tree subjected to pruning depends in a great measure on the equal distribution of sap in all its branches.* That this equal distribution may take place—

1. *Prune the branches of the most vigorous parts very short, and those of the weak parts long.* The feeble parts being pruned long, present a great number of buds and a large surface of leaves, which attract the sap, and produce vigorous growth; while the vigorous parts being pruned short and the surface of leaves diminished, growth in those parts is also diminished.

2. *Leave a large quantity of fruit on the strong part and remove the whole or the greater part from the feeble.* The sap which arrives in the strong part will be appropriated by the fruit, and the wood there will make little growth, while the feeble parts being deprived of fruit, the sap will be appropriated by the growing parts and they will increase in size and strength.

3. *Bend the strong parts and keep the weak erect.* The more erect the branches are, the greater will be the flow of sap and consequent growth; hence, the balance may be restored by bending down those disposed to make too much growth.

4. *Remove from the vigorous parts the superfluous shoots as early in the season as possible, and from the feeble parts as late as possible.* The fewer the young shoots are in num-

ber, the fewer the leaves, and the less the sap is attracted there; but leaving these standing on the feeble parts, these leaves attract the sap and induce vigorous growth.

5. *Pinch early the soft extremities of the shoots on the vigorous parts, and as late as possible on the feeble parts, excepting always any shoots which may be too vigorous for their position.* By this practice the flow of sap to that point is checked and turned to the growing points that have not been pinched.

6. *In training, lay in the strong shoots on the trellis early and leave the feeble parts loose as long as possible.* Laying in the strong shoots obstructs in them the circulation, and favors the weak parts which are at liberty. Giving also the feeble parts the benefit of the light in training, and confining the strong parts more in the shade, restores a balance.

II.—*The sap acts with greater force and produces more vigorous growth on a branch short pruned than on one long pruned.* The whole sap of the branch acting on two buds must produce greater development of wood on them than if divided among fifteen or twenty. Hence, to produce wood branches, we prune short, or if fruit branches, we prune long, because slender and feeble shoots are more disposed to fruit. Hence, also, trees that are enfeebled by over-bearing should for a year or two be pruned short, until the balance is restored.

III.—*The sap tending always to the extremities of the shoots causes the terminal bud to push with greater vigor than the laterals.* When we wish a prolongation of a stem, we should prune to a vigorous wood bud, and leave no production that can interfere with the action of the sap on it.

IV.—*The more the sap is obstructed in its circulation, the more likely it will be to produce fruit buds.* Sap, circulating slowly, is subjected to a more complete elaboration in the tissues of the tree, and becomes better adapted to form

fruit buds. If we wish a branch to bear fruit, we can obstruct the circulation of the sap by bending or making incisions around the branch, or if it is wished to change a fruit into a wood-branch, raise it into a vertical position and prune it to two or three buds, on which we concentrate the action of the sap and induce them to grow vigorously.

V.—*The leaves serve to prepare the sap absorbed by the roots for the nourishment of the tree, and aid in the formation of buds on the shoots.* All trees, therefore, deprived of their leaves, are liable to perish. Hence, the leaves should never be removed from a tree under the pretext of aiding the growth, or ripening the fruit, as, deprived of leaves, trees cannot grow, neither can their fruit mature.

VI.—*When the buds of any shoot or branch do not develop before the age of two years they can be forced into activity only by a very close pruning, and in some cases, as the peach, even this will fail.* Hence, the main branches should be trimmed so as to secure a development of their successive sections, and so shortened in as not to allow the production of long, naked stems, leaving the interior of the tree bare of shoots, and consequently unproductive.

In order to induce trees to grow in any particular form, it is not so much labor as continued attention that is required. A thorough pruning once a year will not produce the desired effect, but a little attention two or three times a week during the growing season will be sufficient to examine every shoot in an acre of garden trees, and the eye is very soon trained so as to detect at a glance the shoots that require attention. (*Du Breuil, Lindley, Barry, etc.*)

TRAINING.—The principal objects of training are to render plants more productive of fruits and flowers than if left to grow voluntarily, also to form screens of various running plants to keep any unsightly object from view.

The points to be attended to are to entirely cover the wall or trellis, bending the branches backwards and forwards so as to form numerous deposits of returning sap, and ensure the full exposure of the fruit-bearing branches to the sun and air. The long shoots are shortened or pinched to make them throw outside branches, with which the trellis is covered, without permitting them to cross each other. Training flowering plants is necessary that they may appear in elegant and symmetrical form. It should be regulated by a knowledge of their habits of growth and consists principally in checking over-luxuriance of growth and tying them to stakes or frames. Directions for training the grape, etc., will be given hereafter.

CHAPTER XII.

TRANSPLANTING.

In the operation of transplanting, the main points to be regarded are the proper preparation of the soil for receiving the plant; care in taking it up so as to avoid injury to the small, fibrous roots; setting it firmly so that its roots may take a secure hold of the soil; planting with as little delay as possible; and, lastly, maintaining the balance as far as practicable between the top of the plant and its roots, so that the former may not lose more by evaporation than the roots absorb, until again established.

PREPARATION OF THE SOIL.—Plants, when removed, need a freshly dug soil which affords a moist situation in which the delicate fibers may be emitted, and therein quickly establish themselves. If also well drained and trenched, the effect upon present and subsequent growth is very decided: a tree or vine thriving much better in such a situation than if the roots are put into a hole with none of the surrounding soil loosened. The soil ought also to be enriched with fine manure, but no coarse, unfermented manures should be applied where they will come in contact with the roots. When the ground is in a suitable condition, holes should be dug for the reception of the roots of the plants. These had better be made square than round, as a large hole in that form can be sooner made. The diameter should be such that it will receive all the roots when fully extended. The holes should be made too large rather than too small. In digging the holes, throw out the best soil on one side and the poor on the opposite. If the ground has been prepared deeply, the holes may be made just deep enough to receive the

roots, which, in some cases, are spindle-shaped and extend downwards to a considerable depth, and in others run along the surface. For most plants the hole should be deeper at the sides than at the center, leaving the bottom convex and not basin-shaped. It should have the bottom soil loosened, and in dry weather be watered, but the water should be allowed to subside so as to be moist, not wet, at the time of planting. It should be left of such depth in all good soils, that the neck of the plant may be as near the surface as before, or but a trifle above; but in clayey soils, ill drained, let it be somewhat above on a broad, slightly elevated mound.

TAKING UP THE PLANTS.—In this operation *avoid injury to the roots;* with the utmost care they will be mutilated. A little attention will save a year's growth to a tree. The roots are of two kinds, the main roots which support the plant in the earth, and the small branching or fibrous roots, the fresh tips and numerous fibrils or root hairs of which supply it with nourishment. These parts are of great delicacy, and if injured or broken off, the plant must throw out others, or perish for want of nourishment. These fibrous roots are the ones most likely to be destroyed or injured in taking up, and in replanting to be squeezed between stones and hard lumps of earth, so that the circulation is weakly and imperfectly carried on through diseased and defective organs. The roots of a tree, therefore, when transplanted, must be examined, and all those injured and all the small fibrous extremities in bad condition should be cut back with a sharp knife to the sound parts before it is reset, in order to force the root to throw out new fibers, which, in many plants, are produced in great abundance from where a root has been cut back with a clean cut. Roots, matted with fibers, should be disentangled and soil introduced among them in planting, so as to separate them from each other.

While the plant is out of the ground, its roots should be protected from exposure to the air, and, if not planted immediately, should be covered with earth. Many trees are ruined by lying out exposed to the sun for hours while holes are being dug to receive them. Before the tree is reset, the top also should receive the necessary pruning.

REPLANTING.—After the holes are ready and the tree prepared, its roots should be laid upon the convex surface to see if the hole is of the proper depth, which may be judged by the eye, or more exactly by laying a rod across the hole close to the stem, resting on the level ground on each side. If the neck of the plant is too high or too low, make the necessary alteration, bringing the bottom to the proper height, and convex as before. Hold the tree lightly—if it is in the same aspect as before, in respect to the points of the compass, it certainly can do it no harm, and many cultivators think it important. Let the roots be nicely spread over this convex surface, training out the leading roots at distances as near equal as possible, not bundling the small roots together, but separating them with particles of fine soil. Then, holding the stem firmly and erect, save a slight inclination towards the side from which the heaviest gales or most constant winds are expected, throw the finest, lightest soil, from that reserved by itself, down near the stem, letting it fall down towards the extremities of the roots, and introduce it carefully with the hand among the roots. Having thus covered the lower roots, those above should also be adjusted and covered with the same care, and when all are well covered, water may be given with advantage, unless the soil and weather are moist. If not watered, when the roots are well covered, the earth should be moderately pressed upon them by treading the soil (being careful not to injure them), if the ground is light and friable, but by no means if wet. After watering or treading, the re-

maining soil should be put on, leaving the collar of the plant covered a very little deeper than before (in the case of trees some two inches), and the looser and drier this surface soil is the better will it resist drought. If the body of the tree is held firm by tying it to a stake, it will prevent the loosening of the roots by the action of the wind upon the tops.

Checking undue Evaporation until the Plant is Established.—The maintaining the balance between the top and root of the plant is best secured by performing the whole operation at the proper season, in mild, moist weather, and with as much dispatch as possible, meanwhile protecting the roots from the air and sun; by *pruning severely* the tops of plants that admit the operation, thus lessening the evaporating surface; and by guarding with the greater care from injury the roots of conifers and other plants that do not. Removing a large portion of the leaves will likewise diminish the evaporating surface, and is very necessary in planting hollies and evergreen oaks. Shade from the sun those plants that require such protection (and nearly all are thus benefited), and water to supply the absorbing extremities of the roots with an abundance of food, that the increased quantity imbibed by each may, in some degree, make up for their diminished number. Mulching the surface thinly after a rain is also useful in preventing undue loss of moisture from the soil.

Preparation of Trees for Transplanting.—As a rule, there is little gained by planting out large trees. Small trees, as Downing remarks, can be taken up with a system of roots and branches entire, while the older and larger tree, losing a part of its roots, requires years to resume its former vigor. Trees, transplanted while small, will prove more healthy, vigorous, and enduring; but sometimes, for immediate effect, or to preserve a favorite

tree, it is necessary to transplant it when of larger size. This is done by shortening in the leading roots at a distance from the trunk, varying with the size of the tree to be operated upon. A circular trench is dug in spring or before midsummer around the whole mass of roots, partially undermining them and cutting off all that extend into the trench, which is dug at such a distance from the tree that it encloses a sufficient ball of roots; the trench may be filled with poor earth, or covered with plank. The tree will be checked somewhat, and will fill the ball around it with a mass of fibrous roots, and in the proper season can be moved with safety. Many trees naturally tap-rooted, and evergreens difficult to transplant, are, by being transplanted annually or biennially from their seedling state, compelled to throw out a mass of fibrous roots, retaining among them a ball of earth, and are thus ready to be moved at any time without danger.

It is often desirable to plant fruit trees before the leaves naturally fall, in seasons when autumn frosts are unusually late. A week or two before the trees are to be taken up, pluck from them every leaf, and allow them to remain and ripen their wood. After this time they can be taken up, packed, and sent safely long distances without shrivelling. Meanwhile the ground should be prepared, the holes made, and, after pruning, plant them out, giving them a good watering before the last soil is thrown in. In this way, where much planting is to be done, a month's time in autumn is gained.

Transplanting Herbaceous Plants.—Most of these are easily transplanted as soon as they have done flowering, or before they begin to grow in the spring. For annuals, when the season is somewhat advanced, a damp, cloudy day, just before or just after a shower, or in the evening, is the proper time for the operation. Imme-

diately after a very heavy rain is not the best season, as the soil, if moved while too wet, forms a crust about the plant. In the case of choice young plants, they should be taken up with a trowel, removing them with a ball of earth, and the plant will hardly be checked in its growth. Larger plants may be taken up in the same way with the transplanter or spade. Those not removed with a ball, may be grouted by mixing up a quantity of rich loam in water to a semi-fluid state, and inserting the roots therein. Plants that suffer little in taking up, like the cabbage, may have a hole made in the earth with a dibble and the plant inserted therein, when the dibble is again inserted a little obliquely near the stem, and the earth pushed up close to the root. All tap-rooted plants are moved with difficulty. Many herbaceous plants—sweet-potato slips, for instance—can be safely set out in dry weather in freshly moved soil, by making a hole for their reception, setting the plants therein, and just covering the roots with fine soil; then fill the hole with water about the roots and cover them at the surface with dry soil, to retain the moisture and keep the surface from baking. The operation must be performed in the evening.

All valuable herbaceous plants should be protected with sun shades or plant protectors, when just planted, if the sun comes out hot.

CHAPTER XIII.

MULCHING, SHADING, AND WATERING.

MULCHING.—Mulching is placing litter of various kinds, as leaves, pine straw, or strawy manure, upon the surface soil over the roots of plants and shrubs. If leaves are used, a little earth may be required to keep them in place. Mulching is used as well to prevent moisture from evaporating from the soil in summer, as to prevent frost from penetrating to the roots in winter. In summer a mulch is usually applied to trees and shrubs newly transplanted, and to herbaceous plants that are impatient of heat about the roots. Irish potatoes, mulched, produce more abundantly, and are of better quality. Strawberries, thinly mulched, with the crown uncovered, are much more productive and continue longer in fruit. Rhubarb and other plants, requiring a cool soil, can thus be more easily raised; and so with many other crops. Summer mulching should be applied directly after a rain, that the moisture in the soil may be retained. It should not be applied to potatoes or other tender plants until the danger of frost is over, as the increased evaporation from damp mulch will produce a white frost when there is none or little elsewhere formed. Fruit trees, by having their roots mulched, are kept in better health and vigor. Mulching not only wards off drought, but, in this way, by keeping the ground moist, and by the decay of the mulching substance, a good deal of food is conveyed to the plants. Some authors are of the opinion that ground will become continually richer by being shaded. But the great benefit of mulching is that a steady permanency of moisture is retained, in spite of adverse circumstances, and without stagnation. In general, the coat of litter

for mulching must be thin, that the rain may not be prevented from reaching the roots of plants.

Many plants, nearly hardy, can be kept through the winter safely by a coat of dry litter over the roots, and especially the crown of the plant, to turn off a portion of the rain and to keep frost from penetrating to their roots. Verbenas, which would perish without this protection, are often kept over safely under a cover of two or three inches of leaves. So of other plants, where the object is to protect the root and crown, but not the foliage. Mulching has the disadvantage of being untidy in appearance, and of affording shelter to insects and mice, and damage also may occur from its being carelessly set on fire from a cigar, or in cleaning up the garden, thus destroying the plants it was intended to protect.

SHADING.—In all glass structures during the warmer portion of the year, some provision must be made for shading. This may be done by thin sheeting, but as this is expensive from its rapid decay, it is usual to whitewash the glass externally as often as may be necessary. The autumn rains will soon wash it off when the season comes in which more light and heat are desirable. The lime of the whitewash, however, soon loosens the putty, so that a preparation of thin flour sizing, thickened with a little pipe clay, will be found better, though not as easy to remove. Where a glass is not needed, as for keeping camellias, and other plants, in pots through the summer, a sort of lattice, made by nailing laths upon a light, oblong frame made for the purpose will be found useful. Laths can also be tied together with coarse twine, being separated by one or more knots, as greater or less distance is desired. Mats and old salt and coffee sacks are often used, but they exclude too much light, and are best employed to prevent radiation, and thus keep out frost in winter.

WATER is beneficial to plants as a vehicle for conveying all soluble matters which form the food of plants, whether they be animal, vegetable, gaseous, or earthy.

Other elements being present in sufficient quantity, the growth and health of a plant will be more or less satisfactory in proportion as it is or is not supplied with all the water it can consume. The action of water is not, however, always beneficial. Injudiciously applied, it destroys more plants than almost any other item of mismanagement. In excess, it is always injurious. It fills the spaces in the soil which would otherwise be filled with air, and plants are choked and perish for want of this indispensable element. A superabundance of water, for a time, increases the growth of foliage and renders it tender and succulent; hence a good supply thereof is needful to plants, the leaves of which are eaten, as lettuce and spinach.

But by this excess the production of flowers and fruits is delayed. The odor of the former and the flavor of the latter are weakened and impaired. The size of the fruit is increased by abundance of water, and without it the strawberry, for instance, will not swell; but the increased size, unless it ripens in a bright atmosphere, or the quantity of water is diminished as the fruit ripens, is partly at the expense of flavor. Fruit is not only impaired in quality, but is very liable to crack or burst from excess of moisture, as the plum, grape, or stanwix nectarine often do, or rot upon the tree while still immature, as the peach, plum, etc.

An excess of water softens the tissues of plants, and renders them much more liable to injury by frost. A frost directly after warm and abundant rains, when plants are full of sap, is much more fatal than the same temperature in dry weather.

The temperature of the soil, if wet, is greatly lowered,

and its capacity for heat diminishes. The constant evaporation from wet soil so lowers the temperature of the adjacent stratum of air, that frosts occur when there are none on dryer soils. The constant dampness of the atmosphere, produced by excess of water in the soil, diminishes evaporation from the leaves of plants, and hence renders the process of assimilation slower, and less food is taken up by the roots. By diminishing the absorption of carbonic acid, it lessens the atmospheric supply of food. It creates a tendency in the organs of plants to vary from the normal type of growth, changing the flowers, for instance, into green leaves and ill-formed shoots.

Succulent plants, those with fleshy roots, and those with leaves that appear dry, and transpire but little, and in which vegetation proceeds slowly, are most subject to injury from excess of water. Plants growing in a clear light are less endangered by an over supply than if growing in a shaded situation, as they can both assimilate and perspire more. Plants in pots are most likely to be injured by injudicious watering, at times being drenched with too much, and at others allowed to become too dry.

Where water exists in excess, it must be removed by drainage. This is indispensable in pot culture. It is particularly to be attended to in the case of plants which are to be kept through the winter in green-houses or pits.

The quantity of water that plants require varies with the species of plant and with its condition, whether in a state of growth or repose. A plant cultivated for its leaves requires more water than if grown for its flowers, and still less is needed if grown for its seeds or fruit. In proportion, also, as the roots of plants extend into the earth, the less water at the surface is required. Tap-rooted plants, like cotton, when once established, are not apt to suffer from drought; but those with roots at the surface only need frequent watering. Perennial plants,

also, in general require less the artificial application of water than annuals. The growth of the former is merely suspended by dry weather for the time being, to be resumed when moisture is supplied; but if water and the food of which it is the vehicle be withheld from annual plants, the double tax imposed upon them by nature of forming both roots and shoots at the same time, can no longer be met. Growth being suspended, the plant attempts to flower and ripen seed, and thus, while imperfectly developed, it reaches the limit of its existence and dies.

Plants with fleshy or fibrous roots are impatient of abundant waterings, yet do not well resist drought. Bulbous and tuberous rooted plants, and those with fleshy leaves, can support drought a long time and do well with rare but abundant waterings. Germinating seeds and young plants should be watered lightly but frequently. In a state of free growth, water abundantly; while ripening fruit, water rarely; when transplanting, water freely.

The lighter the soil, the more frequent and copious must be the supply of water. When the temperature in summer becomes elevated and the days are clear and the atmosphere dry, and evaporation increases, while rains become less frequent, water must be given more copiously; for at such times mere sprinklings bake the soil and do more harm than good.

When at rest, as in the winter of temperate climates and in the dry season of the tropics, very little moisture in the earth is required by perennials, except marsh plants. Bulbs in a state of rest will endure almost any amount of dryness, and may even be exposed to excessive heat, somewhat resembling, in this respect, a ripened seed. Bulbs that have been kept dry for some time, when again to be started into growth, should receive but little water at first. If much is given, it will be absorbed with-

out being digested, and, stagnating within, will destroy the bulb. Hence, we plant bulbs in a light soil and on raised beds, that the superabundant moisture may not destroy the roots.

But a moderate degree of water is needed when vegetation commences in the spring, for the earth is usually sufficiently moist; but when they have started into growth, plants should be abundantly supplied, and the quantity gradually diminished as the organization becomes complete. As autumn approaches, evaporation becomes less, and the supply of water should be diminished, both in the quantity and frequency of application. Withholding water gradually from plants that are to be kept through the winter will cause them to ripen their shoots, and they will be more likely to survive the cold season.

No plant, at any time, should receive more moisture than it can consume either by assimilation, or rejection in the form of perspiration. Plants with large, broad leaves, like tobacco, squashes, etc., expose more surface to the light and sun, perspire freely, and hence need more water than those with small, pinnate leaves, like the acacia, or than succulent, or fleshy plants, a class that requires but little water at any time, and is very impatient of an excessive supply, especially in winter.

Watering artificially is resorted to in order to maintain a proper degree of humidity in the soil. This is indispensable in hot-houses, etc., and with all plants in pots. With these the protection of the glass assists in keeping the air about the plants in a state of humidity.

But in open air culture, artificial watering can never be so beneficial as natural rain, and is often, indeed, a real disadvantage to plants.

Artificial watering, with all its disadvantages, must, to a considerable extent, be resorted to in hot climates,

or the results of gardening will often be quite unsatisfactory. In giving it, the conditions of beneficial, natural watering should, as far as possible, be observed. The rains that are most refreshing to plants are those of mild temperature and which distil gently, bringing to the roots of plants not moisture only, but ammonia and carbonic acid. If rain did not bring with it fertilizing matters, it would in time wash out all the fertility of the soil and leave it sterile. This is the effect of heavy, beating storms, which carry away more of fertility than they bring; while if the soil be stiff they puddle the surface, rendering it, when dry, impervious, preventing the access of atmospheric air and the moisture of the dew and of any gentle rains that follow.

Hence, in applying water, it should not be thrown upon the soil with force from a coarsely perforated watering pot, as its effects would be injurious in precisely the same way as a washing rain. To tender plants and germinating seeds it should be applied through a very fine rose. The rose to a garden watering pot should not permit a common pin to enter its perforations. For delicate seedlings in pots it is better to give water by sprinkling gently from a wetted brush, both the plants and the soil. For larger plants in pots or in the ground, the leaves may be sprinkled, unless too succulent, but the main supply of water should be given by pouring it gently upon the sides of the pot or upon the surface of the earth, and let it flow gradually over and sink into the soil.

It is not best, in general, to water close by the stems of plants. The roots take up food only at their extremities, and generally extend as far as the branches. Both the roots and leaves of plants require water, and receive it in natural watering. But the rains that fall upon a tree do not fall upon its trunk, but roll off all around it, and drop precisely where the extending roots are ready

to take it up. Watering directly at the base of a plant, close to its stem and collar, will be likely to rot or injure that vital part, and small, delicate plants are pretty sure to damp off. Thus applied, much of the water never reaches the absorbing extremities of the root. As a plant increases in size, the farther from the stem should the water be applied.

Vines trained to verandas, or growing up under the eaves of dwellings, often suffer from the want of water applied to the foliage. Trained against the walls, evaporation goes on very rapidly from the heat reflected upon them, and but very little rain falls upon the foliage. They also become covered with dust and their pores choked therewith. When the sun shines warm and brightly, plants should be watered only about the roots, for if applied to the foliage, the drops remaining thereon act as so many burning glasses, and scorch the leaves, covering them with brown spots wherever the water rests. But in the spring, when the earth is moist, if the air is dry, and indeed at all times when the atmosphere is dry, and particularly when plants become covered with dust, they will be greatly refreshed by syringing or sprinkling the foliage in the evening or morning, if their leaves are not susceptible of change by humidity.

Plants in pots should be watered frequently and little at a time. If the ball has become dry, do not deluge it at once, as it will flow directly through the pot or out at the sides, carrying with it the richness of the soil, while the ball still remains dry. Give it a little water, and when that soaks up, give, a few minutes after, a little more, until the entire ball is in a suitable state of humidity. The drainage must be good, or if much water is given to plants in pots, the soil will become heavy, water-logged, and impervious to the atmosphere.

The best water to use is rain water, caught in open

cisterns, as it is well aerated and abounds in ammonia and fertilizing gases. If spring or well water must be used, add a very little guano, say a pound or two to twenty gallons of water, giving the smaller quantity to delicate plants, and the larger to gross feeders, and before using let it stand a few hours. Manure from the hen roost in double quantity may be substituted for guano. For sprinkling the foliage, pure water is better.

The temperature of water, too, must be regarded. The good effects of bottom heat in hot-beds, or of artificial heat in greenhouses, are often entirely counteracted, and plant growth brought to a stand by watering with cold water. It is not only the lowering of the temperature of the roots of plants, but the suddenness of the change that is injurious and often fatal. Water should always be applied a few degrees warmer than the soil, that growth may be promoted and not checked.

As to the time of day at which water should be given, unless applied quite freely, it does little good in the heat of a summer's day, as the hot atmosphere drinks up the moisture before the plant can imbibe it. The effect of rain can be best secured by watering just at night, when the falling dew will, in some measure, prevent evaporation from the plants, and they will be fully refreshed during the night. But in the spring of the year, to water in the evening in dry weather darkens the soil, and, therefore, increases radiation. Evaporation is also greatly increased; the temperature sinks rapidly, the plants are chilled, if not frozen, and make less growth than if not watered at all. So, also, in autumn, for the same reason. In both spring and autumn, therefore, water only in the morning, and the heat of the soil will not be materially lowered, the sun's rays communicating fresh warmth.

It should be the great object of the gardener to avoid the necessity of watering, by shading the earth or the

plants themselves by mulching, top-dressing, or sun shades. Seeds will come up much more satisfactorily in the open ground if shaded, than if one depends upon watering. If watering is resorted to at all, it should be given copiously and the supply kept up until the plants are established. After watering, the ground should be stirred about the plants, if up, as soon as it is sufficiently dry, and never allowed to become hard. A mulching of leaf mould is desirable, to keep the surface in a proper state, and if applied when the surface is wet, it will prevent the necessity of repeated waterings. (*De Candolle, Lindley, McIntosh.*)

Summer Cultivation.—If before seeds are planted, the soil be deeply moved and finely pulverized, the labor necessary in the subsequent culture of garden crops is greatly diminished. Still, the hoe cannot be dispensed with, and the soil is stirred therewith among our growing crops, in order that the earth may be kept in a light and permeable state, so that the roots of plants may extend freely through it in search of food. If kept in this condition, water deposited by rain and dew is imbibed more readily and sinks more deeply into the soil, supplying plants both with moisture and ammonia. Moisture from beneath is also more freely supplied by capillary attraction from the subsoil if the earth is kept in a light, porous state. The atmosphere, laden with nutritive gases, freely penetrates the soil and deposits nourishment within reach of the young rootlets of plants. By the same process weeds are destroyed, their growth prevented, and there is also a thorough pulverization and intermixture with the soil of the manures which have been applied.

Judgment as to the time and manner of hoeing must be exercised. Even hoeing may do harm—but there is more danger that it will not be done sufficiently often, than performed imperfectly. In a hot and a dry climate, hoe less

deeply than in those that are cold and moist, as hoeing favors evaporation, and this may prove injurious where the sun is hot and the rains are not frequent. So in spring, hoe more deeply and frequently than when the season becomes advanced. A heavy, argillaceous soil should be more deeply moved than one more sandy. Where a poor soil has been recently manured, it should not be hoed too deeply, but the compost should be allowed to remain intermixed with the surface soil.

In practice the plants cultivated and their stage of advancement must also be considered. Plants with long tap-roots, like beets and carrots, are benefited by deep hoeing, which might be injurious to those with fibrous and spreading roots. Among the latter, deep culture between the rows is beneficial, so long as the plants are young, and their roots not extended; but when they begin to shade much of the surface, and to occupy most of the soil with their roots, merely loosening the immediate surface, at the same time destroying all weeds, will be quite sufficient.

All garden crops, then, should be frequently and deeply hoed early in the season, and in the early stages of their growth. Even to suppress the weeds which spring up freely in the moist soil at that time requires frequent and thorough hoeing. Of course, hoeing, or moving the soil in any way, is not to be undertaken while it is wet. When young seedling plants first appear, the earth must be lightly stirred about them, to break up any crust upon the surface that may have formed. Take care not to injure the young plants, though at this time the mutilation of a few roots, if the most of them are unhurt, is easily repaired; and the plant is not so much injured by their loss as benefited by that thorough pulverization of the soil that permits the free extension of the roots, and opens it to the air and night dews.

At this time all weeds should be removed, and the plants thinned to an inch apart, so as not to interfere with each other. When they have made a little more growth, and there is less danger of insects and other disasters, they should be thinned to the proper distance and hoed more deeply, taking care not to cover or injure the young plants. After this continue to keep the soil light and open, of course destroying all weeds.

In heavy loams, watering or dashing rains will frequently puddle the surface, which bakes in the sun so effectually as to exclude the atmosphere. The rains that follow flow off without sinking into and moistening the soil. But a soil which, soon after each rain, while not too wet, is freshly hoed, will, at all times, present an open, porous, finely pulverized surface, ready for the absorption of plant food from the atmosphere, and easily permeable to the roots of plants in search of it.

As the plants increase in size, the ground is shaded by their foliage, which, in a measure, prevents the growth of weeds and protects the surface of the soil from being hardened by the sun. At this time hoeing is less required, nor can it be performed without considerable mutilation of the branches and larger roots, and thus cutting off in part their communication with the soil—injuries from which plants in an advanced stage of growth, and under the burning heat of summer do not readily recover.

It is not fully decided whether the soil should be frequently stirred during droughts. Our present opinion is, that in all warm climates it should, at such times, be undisturbed. If the earth be already loose and in fine tilth, the air that enters into its pores will deposit its moisture therein. At night the dews are deposited much more heavily upon freshly dug soil. But this deposit of atmospheric moisture will avail little if the surface is often stirred, as more water will be given off by day than is

absorbed at night; and a plot frequently hoed during a drought would at length become quite dry to nearly the depth it was cultivated. However it may be in England, here no deposit of moisture from night dews, or supply brought up by capillary attraction from beneath, can make good the loss of water by evaporation from the soil in a hot summer day. De Candolle says that in most hot countries frequent hoeings are avoided, as they really have the evil of favoring evaporation of moisture from the soil at the time when, the heat being most intense, the water is naturally retained therein by the hardening of its surface, and would act with most activity in decomposing and dissolving the organic matters it contains. The true course is deep, thorough culture early in the season and while plants are young. But hoeing must not be performed in spring or autumn, at times when the indications are that frosty nights will follow, as tender plants are much more likely to be killed thereby from the increased evaporation at the surface of fresh dug soil. Through the summer, after each good rain, as soon as the ground will do to work, stir the surface and kill the weeds, leaving it in a light, friable condition, to be undisturbed, unless to destroy any weeds that appear, until another rain renders further hoeing necessary. Continue this until the plants approach blossoming, or begin to cover the ground, after which hoeing, if performed at all, must be as shallow as possible. A soil thus managed is always open to atmospheric influences, and what moisture it may have or receive is better retained.

CHAPTER XIV.

PROTECTION FROM FROST.

Late spring frosts are the terror of gardeners. In sections of country subject to them, tender plants should not be planted early. As mulched or newly dug soils are much more liable to the white frosts of spring, mulching should not be applied to Irish potatoes, etc., until danger of frosts is over, nor should tender plants be hoed when a change to cold may be anticipated. If a frost is apprehended, plants in hills are best protected with boxes, vine shields, or plant protectors placed over them. Rows of beans or potatoes can be secured by covering them with wide plank placed on blocks two or three inches above the plants. "Almost all the modes of protecting plants are founded on the doctrine of radiation, and hence the fact should be kept constantly in mind that all bodies placed in a medium colder than themselves are continually giving out their heat in straight lines, and that these straight lines, when the body is surrounded by air, may always be reflected back upon the body from which they emanate by the slightest covering placed at a short distance from them; while, on the other hand, if this slight covering be placed close to the body, instead of reflecting back the heat it will carry it off by conduction—that is, the heat will pass off through the covering closely applied, and be radiated from its surface." (*Daniel.*) Hence, the covering or protection given is far more efficient if it enclose a stratum of air without actually touching the plant.

When plants are actually frozen, in many cases they may be saved if they can be thawed gradually without exposure to the sun. To effect this, if coverings are ap-

plied before sunrise, or the plants are sprinkled repeatedly with water until the frost is extracted, they generally escape without serious injury. If a frosty night is followed by a cloudy or foggy morning, injury to plants need not be apprehended.

Fruit trees and vines in blossom, or with young fruit set, are in some large districts so liable to suffer from late spring frost, that fruit bearing, in the case of those first to bloom, is the exception. The crop is lost, perhaps, two years out of three. It is seldom in the most frosty localities that they are endangered more than two or three nights in a season, all the fruit of the peach being rarely killed until it begins to enlarge, and the blossom is on the wane. Such trees are too large to admit of being covered. They can, however, be fully protected by smoke. Ordinary smoke in still, frosty nights, rises rapidly, and to be of any service, it must settle over the trees in a moderately dense cloud, acting as a screen and preventing radiation. A heavy, damp smoke, not rising rapidly, in which the trees are kept fully enveloped until some time after sunrise, is what is necessary to protect a fruit garden. A slight frost will do fruit blossoms little injury, and there are some which will bear a good many more degrees of cold than others. When a severe frost is pretty certain, billets of short, dry wood, fat light-wood, and piles of wet tan, sawdust, or other damp trash, should be distributed about two rods apart over the fruit garden, and the most to the windward. The tan or trash should be distributed during the winter. About three o'clock in the morning is soon enough to start the fires, each of which is made with three or four of the billets, being kindled with the light wood. When well lighted, put on and nearly smother it with the wet tan. If it again break out into a blaze, apply more tan, and keep up damp, smouldering fires, and a curtain of smoke over

the trees until the sun is well up and the frost fully extracted. If the fruit is frozen hard as bullets, have no fears, but keep up a dense smoke. By this mode of applying smoke the peach crop can be saved every year. There is no doubt about it. When a boy—thirty-five years ago—we ate of pears thus saved by an uncle of ours, and have ourselves since repeatedly practiced it and seen it tried by others. Our Gardening was the first English work, so far as we know, in which this mode of protection was published, though French authors, we find, allude to the process. Boussingault says it is as old as the Incas of Peru. The peach crop has thus been preserved with the mercury as low as 24 on the morning of March 27th, and the blossoms mostly fallen. Without such protection few good varieties of the peach are safe with the mercury below 30 . The expense of the operation is but a trifle, compared with the value of a fine crop of fruit in a locality where all, not thus protected, is cut off.

Winter protection is also necessary for the preservation of many valuable plants, the limits within which they are naturally found being much narrower than those within which they can be grown in perfection with a little protection. Besides ordinary bedding plants which are stored during the winter in pits or other structures, and again occupy the beds and borders when danger of frost is over, there is a large class of plants, that, with a slight protection where they stand, will pass the winter safely, and throw up much more vigorous shoots than if taken up and replanted. A friend of ours succeeds perfectly with the fig in Pennsylvania by bending down the limbs yearly and covering them with earth; while in Georgia, with no protection, they are occasionally killed to the ground.

Ordinary herbaceous plants need no protection unless they have been divided or transplanted in autumn. Those

that are more tender may have their roots and crowns protected with moss, straw, or coarse stable manure, not placed so thick as to heat. If leaves are used a little soil or brush should be thrown over them to keep them in place. Tender bulbs are protected in the same way. If the foliage is evergreen, it must not be smothered with too thick a covering.

Shrubby plants may have their roots well covered thus, and their stems bound with straw or moss. For small shrubs, a few evergreen boughs thrown over them is a good protection; larger ones may have their branches drawn together and wound with straw. Tender roses may have tan-bark or sawdust banked up about their stems, to be removed in spring.

Climbing plants, if tender, must be taken down and laid upon the soil to be covered with leaves or earth.

There is some danger where much litter is used, of harboring vermin. Many things are better protected by bending a few hoops across the bed with three or four laths lying on them, on which is thrown a cloth or matting in severe weather. Pansies, carnations, and stocks, are thus generally protected, giving them light and air in mild weather. Flower pots, sun shades, vine shields, and wooden frames, covered with canvas or oiled paper, are all useful in protecting low plants. Boxes and barrels are convenient for larger ones. None of these must touch the plant they cover, as they would conduct the heat away from what they touched. The main object of these coverings is to confine the air and protect the surface from radiating heat.

All plants will endure more frost uninjured in a dry, well-drained soil. In low, damp locations, plants, elsewhere considered hardy, are frequently killed by frost. They are also much more easily injured directly after a mild term starts them into growth.

In Florida protection against frost is secured by the use of laths fastened with wire (the space between each being the width of the lath). This screen spread over the plants greatly retards the radiation of heat from the plant, and reduces the chances for frost.

Mr. E. L. Koethen, a member of the Frost Protection Committee of the Riverside Horticultural Club, of California, gives the following excellent data concerning his experiments on protection against frost. The conclusions are of great interest to all fruit-growers:

1. In sections where there is a prevailing draft from a certain direction concentrate the fires somewhat on the sides of the orchard from which this draft comes.

2. Some fires are needed all through the orchard.

3. If the thermometer should reach 26° by midnight, start firing at once. If smudging is to be depended upon, you should commence much earlier. To be safe, commence lighting baskets, if the thermometer should reach 26° as late as 4:30 A. M.

4. Ripe fruit will stand more frost than green fruit. The above figures are for ripe fruit.

5. The thermometer may go many degrees below the dew-point in our climate on nights when the sun sets behind heavy clouds.

6. A mild day may be followed by a night of danger to citrus fruits.

7. The upper strata of air are much warmer than the lower. Eight degrees was found to be the variation between a height of 5 and 50 feet, upon different tests.

8. Thermometers should be tested each year, and the variation noted and accounted for at each reading.

9. A good way to secure uniform observations and the extreme temperature to which fruit is exposed is to fasten the thermometer to a slender stick five feet long and place in the space between four trees, away from buildings or other shelter.

10. Every grove has some spot that is colder than any other. Find it, and be governed in your firing by the temperature there, keeping your eye on other locations, for the coldest place may shift around.

11. A thermometer that registers too high may be very comforting, but is not a safe guide unless allowance is made for correction.

12. A thermometer that registers too low may cost unnecessary labor, expense, and anxiety.

13. We need a united system of general alarm for localities throughout the valley.

14. Wind-breaks, parallel with the flow of the cold stream air, are an advantage in preventing radiation.

15. Close wind-breaks, at right angles to the flow of cold air, will form dams and cause low temperatures on the upper side. A block of large trees below a block of smaller trees will have the same effect.

16. Coal baskets or brush fires concentrated at these points will drain off the cold air.

17. Flowing water is a help, but is not sufficient in itself.

18. Clean culture and a wet surface is the best condition of the soil in times of danger.

19. Trees that had suffered from lack of water at any time during the development of the crop and those with a dry surface of the soil suffered greatest injury.

20. Firing of any kind is beneficial if there is enough of it.

21. The cost need not be prohibitive for good results.

22. Accumulative firing is better than single-handed.

23. A single grower can succeed in saving his fruit with coal baskets if he has enough of them.

24. Be prepared to make more fires than you will likely need. The unexpected sometimes happens.

25. No grower should depend on his neighbors for heat or smudge. Every gap is an injury to the whole. Besides, your neighbors may not locate their fires so as to do you much good.

26. Coal baskets can be made for about seven cents each. The filling will cost about seven cents, where bituminous coal costs $10 per ton, and you should have from twenty-five to fifty per acre, according to location and size of grove.

27. A little burning straw is a snare and deceit.

28. Straw smudge should be made with wet straw, should be dense, and should cover large areas to yield best results. Dry straw is of little value, except to help burn that which is very wet.

29. The efficacy of smudging being dependent upon preventing radiation in very dry climates, early lighting in such cases is imperative.

30. A little dry brush is a great help in burning very wet straw.

31. Green cypress boughs create a fine smudge.

32. Most groves have a cold corner. Have some brush piles ready to light at the critical hour—about dawn.

33. Coal baskets should be full at the start. Coal will not ignite readily in replenishing if a good bed of coals is not secured at first. A reserve supply of coal may be very useful if the cold is long continued.

34. Coal baskets need less attention than the smudge.

35. Have plenty of help. The better your fires are tended, the better the results.

36. But few employees can be depended upon to look after the details and carry on the work. *Your personal attention is needed.*

37. Every detail should be prepared beforehand. There is no time to hunt up torches and tools after the danger point is reached.

38. Oil fires will do good work, but the smut is objectionable.

39. Evaporating pans give no visible results.

40. An awning or cover was found to be of great service.

CHAPTER XV.

VEGETABLES—DESCRIPTION AND CULTURE.

ARTICHOKE.—*(Cynara Scolymus.)*

The garden artichoke is a perennial plant, a native of the south of Europe, where it has been in cultivation from the time of the Romans. Columella mentions it, and says its name — *Cynara* — is from *cinere* (ashes), because the soil for artichokes should be dressed with ashes. The plant resembles an overgrown thistle, but is more beautiful; has large, pinnatifid leaves, three or four feet long, covered with an ash-colored down. The eatable portion is the undeveloped flower head, which is only fit for use before it begins to open its bloom; it is about the size and somewhat the shape of a small pineapple.

Fig. 100—Artichoke.

As the artichoke is a native of a hot climate, it is perfectly adapted to the temperature of the South, and is hardy throughout the Union. It adds a pleasant variety to our early summer luxuries, and should be in more general cultivation.

There are three varieties—the *Globe*, the *Oval Green*, and the *Purple*. The first has dull purplish heads with scales turned in at the top, and is most esteemed, the

edible parts being larger. The Oval Green is the hardiest sort, and has a conical or ovate head, with pointed scales turned outward. The Purple is earlier than the others, the scales pointed, tinted with purplish red towards their points, but is not so good when cooked. There is also the large green, which grows larger than the common green, and is most esteemed at Paris under the name *Gros vert de Laon*. The base of the scales of this variety is quite thick and fleshy.

The ash of the artichoke has been analyzed, and it is found that potash and phosphoric acid are the most abundant constituents, indicating the application of ashes and bone-dust as the best special manures.

Propagation and Culture.—Artichokes are propagated by seed, or by offsets from the old roots. If by seed, sow in early spring when the peach is in full blossom, in very rich earth, in drills an inch and a half deep, and a foot apart; they do still better by sowing them earlier in a cold-frame. Transplant them when from six to twelve inches high into a rich soil. If the beds are thinned out by transplanting, so that the plants are left a foot apart in the rows, the rest may remain in the seed bed until fall. The finest heads are produced in a rich, moist loam, and they should be transplanted into such a soil. The best compost is a mixture of three parts well-decomposed manure, and one of *leached* ashes. They require an open exposure, free from the shade and drip of trees, or the plants will spindle and produce worthless heads. The rows must be four feet apart, and the plants three feet in the rows. Plants from seed are better and more permanent than from offsets.

If propagated by suckers, these must be slipped off in spring from the parent plant, retaining as many fibrous roots as possible. They should be selected when the leaves are eight or ten inches high, and be taken only

from those shoots which are sound and strong, and have already formed some roots. Uncover the old stools to the origin of the suckers, of which from six to twelve will be produced to each plant. Allow two or three of the best of these to remain; slip off the others with a heel, from which trim off the rough part smoothly, retaining the fibrous roots. Remove the large outside leaves, or their exhalations will exhaust the plant before it gets rooted. They are greatly invigorated if set in water three or four hours before they are planted. Set them in rows, the same distance as above, about four inches deep, in holes made with a trowel; press a portion of fresh soil about their roots and water freely. When this has settled away, fill up to the surface with soil. Keep sun shades or shingles upon the south side of them a few days, until established, giving water, if needed, until they begin to grow.

The only other attention they require during the summer is the frequent use of the hoe. They will produce heads the same year from June to October, and annually thereafter from April to June or July, according to the season. The quality is improved, though at the expense of the quantity, by allowing only the head surmounting the main stem to grow on each stalk, removing all the laterals of the stem while young. As often as the head is cut, the stem should be broken down close to the root, to encourage the production of suckers before winter. They should receive their winter dressing before the ground freezes deeply. Cut away the old leaves without injuring the center or side shoots, dig the ground over, and throw the soil in a low, broad ridge over each row, putting it close about the plants, but leaving the hearts clear. As soon as the shoots appear four or five inches above the surface, the ridges thrown up must be levelled and the earth removed from about the stock to below the

part whence the young shoots spring. Remove all these shoots but two, or at most three, leaving the most vigorous, taking care to select those lowest down on the stock, as the strong, thick ones from the crown have hard, woody stems, and produce but indifferent heads.

Although the artichoke is a perennial, yet after the fifth year, the heads grow small and dry. The beds should in consequence be broken up at this time, or as soon as they begin to fail, and fresh ones be formed on another site.

As the newly-made beds come into flower after the season for the old plants is over, those fond of this vegetable will prefer to make a new plantation every year.

Artichokes are made to attain a much larger size than they otherwise would by twisting a ligature tightly around the stem below each head, and thus preventing the reflux of the sap.

The artichoke is much benefited by the application of seaweed or any other manure containing common salt. This is probably in a great measure because salt keeps the soil moist.

Chards.—After the best heads have been cut, when old plantations are to be destroyed, cut off the stems as low as possible, and the leaves within six inches of the ground. When the new leaves are two feet high, blanch them, as directed for Cardoons, which many think they excel.

For Seed.—Select a few of the finest heads and permit them to flower. Bend over the stalk and tie the head to a small stake, to prevent the water from settling among the expanded scales. When the flower has withered, the seeds will be ripe. One ounce of the seed will produce about six hundred plants, and for three and sometimes five years will vegetate freely if kept cool and dry. Put away in paper bags for use.

Properties and Use.—The artichoke is wholesome, yet

it contains but little nutriment, and is cultivated merely to please the palate. The heads are sometimes pickled. It is eaten by the French as a salad, with oil and vinegar, salt and pepper; the bottoms are often fried in paste like the eggplant. The English gather them when they spread their scales and the flower appears about to open; the whole head is boiled and scales pulled off, one or two at a time, dipped in butter and pepper, and the mealy part stripped off with the teeth. The bottom, when the leaves are disposed of, is eaten with the knife and fork. The flowers have the properties of rennet in curdling milk.

ARTICHOKE, JERUSALEM.—*(Helianthus tuberosus.)*

This is a hardy, perennial species of sunflower, a native of Brazil, introduced into England in 1617, and was much esteemed as a garden vegetable until the Irish potato took its place. The crops obtained in good soils are enormous. The salts found in the ashes are mainly potash and lime, the former very largely.

Fig. 101—Jerusalem Artichoke.

Culture.—It flourishes best in a rich, light soil, with an open exposure, but will thrive in almost any soil or location. Plant in spring or fall, either small tubers or the large ones, cut into sets of one or two eyes, four inches deep, in rows three and a half feet apart. Make the rows run north and south, to admit the sun, and put the plants eighteen inches apart in the rows. Keep the ground free from weeds and earth up slightly. They will be fit for use in the fall. Take care to dig them up thoroughly, as the smallest piece will vegetate. They will grow on land too poor for almost anything else. If the top be cut off one-half way down in August, it is said by some that the

size of the tuber will be very much increased by the admission of air and light. This is doubtful.

Use.—The roots are eaten boiled, mashed with butter, and are considerably nutritive, nearly as much so as the Irish potato. It has a moist, soft texture, and a tolerably agreeable taste. It is, however, rather a second-rate dish. They are better pickled in vinegar. The plant is most useful in feeding cows and pigs, affording large quantities of food from quite poor soils.

ASPARAGUS.—*(Asparagus officinalis.)*

This plant has been cultivated as a garden vegetable for at least two thousand years. Cato, one hundred and fifty years before Christ, gives a full detail of its mode of culture among the Romans. Its culture originated probably in Greece, for its name is pure Greek, and signifies a bud not fully opened; and it is known throughout Europe by names derived or corrupted from the Greek.

The wild asparagus is found on the sea coasts of most parts of Europe. Its stem is not thicker than a goose-quill. From this wild plant, by the aid of manure and culture, our delicious garden varieties were raised. Miller has succeeded in effecting the same result in modern times.

There are only two varieties of any importance—the *green* and the *red-topped*. The latter, with purplish green shoots, is the one principally cultivated. There are some sub-varieties, but these derive all their merit from superior cultivation. R. Thompson states there is really but one sort of asparagus.

Asparagus, like some other plants, has the power of substituting the other alkalies, lime and potash, in the place of soda. All the analyses exhibit large proportions of chloride of sodium, or its elements, chlorine and sodium, also of phosphoric acid. In asparagus, over

three-fifths of the inorganic elements of the plant are made up of these constituents. This explains why salt and seaweed are found useful, and shows that the application of bone manure, or superphosphate of lime, in connection with animal manures, may be beneficial.

Culture.—Asparagus is propagated only by seed, one ounce of which will produce a thousand plants. Sow quite early in spring on a bed of fresh and deep sandy loam, the richer the better—as free as possible from all shade of trees or shrubs. Draw the drills one foot apart, and with a dibble make holes six inches distant, in which drop two or three seeds. Let the seed be covered an inch deep, and press the earth upon it. If unable to sow early shade must be given to the bed, for which purpose pine boughs are well suited. These should be removed at night and on cloudy days, and entirely as soon as the plants are up.

Care must be taken to keep the seed-bed light and free from weeds, though this operation must be delayed until the plants come up. If two plants appear in the same place, the weaker must be removed. Transplanted, these will make pretty good plants by fall. When the stems are withered, cut them down and spread well-rotted stable dung over the bed two inches deep, which will increase the vigor of the plants the next year, and also protect them from frost.

Let the plants remain in the seed-bed until they are about to grow early in spring. To have this delicacy as early as possible, choose a site where the bed can be fully exposed to the sun. If you wish to prolong its season, another bed may be planted on a northern exposure. The subsoil should be dry, and if not naturally so, must be well drained.

The plants will be in better condition for transplanting after remaining in the seed-bed two years. The perma-

nent beds for asparagus are prepared by cutting trenches with a plow. In field culture many growers make these trenches thirty inches apart, to permit cultivation with horse. The plow is run over the trenches two or three times, so that a depth of ten or twelve inches is secured. Well-rotted manure is now placed in and incorporated with the soil by means of a fork. Set the plants in the trenches thus prepared twelve to fifteen inches apart, taking care to spread out the roots, and cover with four or five inches of soil. If healthy plants have been drawn from the seed-bed and good manuring given the trenches, cutting the asparagus may be begun the second year. The cutting must never be continued late in the season, but sufficient shoots must be left to develop leaves, or otherwise the roots will soon become exhausted and the plants will die. After the cutting has ceased the rows must be manured or fertilized by opening with the plow near the plants, placing the fertilizer in and running the plow over again to thoroughly mix the ingredients with the soil. Ground bone is suitable for this purpose.

All weeds must be removed as they appear. As salt is an excellent manure for this plant, the weeds may be easily kept down by its application.* Old brine or refuse salt, in which meat or fish has been packed, is better than any other, as it abounds in the blood and juices of the meat, which are a most valuable fertilizer. Asparagus is a sea-shore plant, and salt will not hurt it, but is life and nourishment to it.

Old beds have been covered an inch deep, and the plants continued to thrive; but a sprinkling just sufficient to make the soil look white is enough. As soon as the plants have turned yellow in the fall, cut them down close to the ground, but be careful not to do this early, or they

* It is but proper to say that the advantage of salt for asparagus is now questioned by some gardeners.—P. H. M.

will throw up new shoots and be much weakened. Remove the stalks and all weeds, cover the beds with three or four inches of good stable manure, and let it remain until time for the spring dressing. If you have charcoal dust at command, a layer of an inch thick over the manure will be found quite useful in preventing the loss of ammonia. When the weather grows warm and spring has fairly opened, and the ground is sufficiently dry, before growth commences, with an asparagus fork dig in the manure placed on the beds in the fall, and loosen the earth four inches deep, taking care not to wound the crowns of the plants. Give the beds a top-dressing of salt, two pounds to the square yard, or kainit at the rate of six hundred pounds per acre, before growth commences, and water freely in dry weather. Applications of liquid manure are likewise very salutary. A good liquid manure for asparagus is an ounce of fertilizer and four ounces of salt to two gallons of water. Fertilizer or night soil composted with charcoal, so as to be entirely inodorous, is also beneficially applied at any time. Another slight covering of charcoal dust, after the spring dressing, will be of service, and make the shoots earlier.

Asparagus should be cut before the heads lose their compact form, when only four or five inches above the ground.* Remove the earth to the bottom of the stalk, and cut it off sloping with a pointed knife, taking care not to wound any other shoots that may be near it, as they are constantly putting forth from the crowns. Too many shoots should not be cut from the beds, nor the gathering prolonged too late. Whenever the bed puts up weak and small shoots, these should be allowed to

* Some market gardeners now send to the market green asparagus that is all cut above ground, because of the demand. The vegetable in this stage is considered to be tenderer and better flavored than the white.

remain, which will increase the size of those remaining, and the future value of the bed. When green peas become plentiful the asparagus bed should rest. After the cutting ceases, you may judge from the size of the summer shoots the productiveness of the bed the coming spring. These elaborate the food for the future crop. The manure applied in autumn has but little effect on the next spring's shoots, but from its influence the strong growth of the succeeding summer will prepare an abundant supply of large shoots the second spring. The spring and autumn dressings should be continued while the bed lasts, for the top soil must be kept perfectly free and light, that the shoots may readily push through it, and the surface left rough, that it may catch and retain the winter rains so as to thoroughly moisten the lower roots. Finally, good asparagus is not to be obtained without an abundant supply of manure. The beds will, if thus treated, remain productive twelve or fifteen years.

Asparagus can be forced by planting a hot-bed *thickly* with thrifty roots; it comes into bearing in four weeks, and affords asparagus for a month in the winter season. Give plenty of air in mild weather.

The following varieties are standard, and may be purchased from the seed merchants already rooted: *Columbian Mammoth*, *Conover's Colossal*, *Palmetto*.

For Seed.—Reserve some of the best shoots in the spring, and mark them by placing a stake by each one, and let them run up and ripen their seeds. Take shoots with fine, round, close heads; fasten them, as they grow, up to the stake, and the seed will ripen better. Gather the seed when ripe, and wash off the pulp and husk, which will pass off with the water, if gently poured off, and the seed will sink to the bottom. Dry them thoroughly, and store away for use. They are, for your own sowing, just

as well kept and sown in the pulp. Asparagus seed will keep four years.

Use.—The tender shoots thrown up in the spring when four or five inches long, are the parts in use, and are very delicate and much esteemed, though not very nutritious. They are excellent simply boiled, or as an addition to soups when in season.

MARKETING.—To enter the market first with this popular vegetable will always secure to the grower good

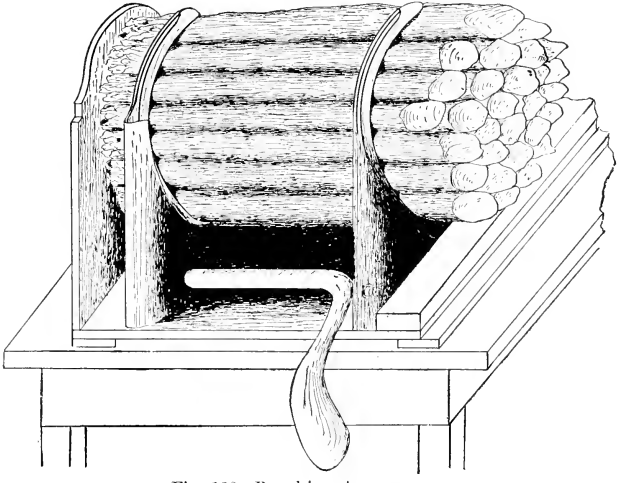


Fig. 102—Bunching Asparagus.

prices. Therefore the policy should be to plant the earliest varieties under the best conditions. But unless the asparagus is properly prepared and packed profits will be greatly curtailed. It is important to understand this fact at the beginning, and to make an honest effort to place the vegetable in the market in the most attractive form. Because of the advanced season in the South the

truckers have a peculiar advantage over the Northern gardeners, and they should strive to avail themselves of this opportunity for reaching the Northern markets before the demand is greatly diminished. After cutting the asparagus the spears are carefully washed and then assorted into Extras, Primes and Seconds, the last containing the smaller spears. The bunching is generally done by women in the use of the "buncher" illustrated in Figure 102. This method insures uniformity in the bunches and neatness in looks. Figure 103 shows the bunch after it has been tied with raffia or other suitable fastener.

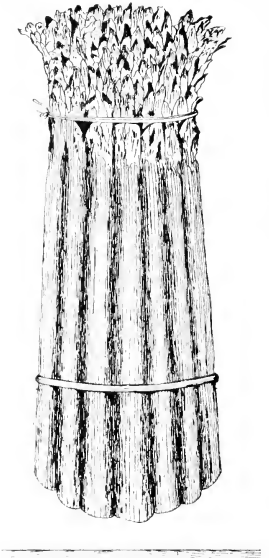


Fig. 103—Bunching Asparagus.

In shipping to a distant market pack carefully in a crate, taking care to have the vegetable so secure that it will not bruise in transit. The crate usually adopted in the South is known as "Southern crate," which is built to hold two to three dozen bunches set on ends on moist moss to keep the asparagus fresh. Shipping by express must be resorted to for long distances, so that the vegetable will reach the market in first-class condition.

BASIL.—*(Ocimum Basilicum, and O. minimum.)*

Two species are cultivated—Sweet Basil (*O. Basilicum*) and Bush Basil (*O. minimum*). Both are annuals, with small leaves and small white flowers, and natives of the

East Indies. Sweet basil is the species most cultivated, and was introduced into England in 1548.

Culture.—Basil likes a rich, light soil, free from shade. The plants may be started early in March, under glass, in gentle heat. They should be thinned when the young plants appear, and transplanted when of sufficient size where they are to remain. Basil is rather difficult to transplant, but can be carefully lifted in tufts with the balls of earth attached, in a moist time, with complete success. Give water and shade until established. It can also be sown on the borders where it is to remain, but if sown too early in the open air, the seed is apt to rot, or the young plants to be killed by frost, as they are rather tender. April is the month for sowing in the open ground. Do not cover the seed deeply, but press the earth upon it. Make the rows ten inches apart, and thin the sweet basil to ten inches, and the bush, which is more dwarf, to five inches in the row. Weeds must be kept under, and the soil mellow, by frequent hoeing. Bush basil makes a very pretty edging. It should be cut not too closely just as it comes into flower, and hung up in small bundles in the shade to dry for winter use; thus cut, it will soon grow up again. When thoroughly dried, it may be pounded fine and kept any length of time in closely stopped bottles.

Seed.—Let some of the finest plants remain uncut, and gather the seeds as they ripen. They will keep for six years.

Use.—The leaves and small tops are the parts employed, and give a delightful flavor in cookery. They have a strong flavor of cloves, and are used in soups and sauces, and other high-seasoned dishes. They are much employed in French cookery. It is the most agreeable of the pot herbs, and the most useful, except parsley and sage.

A small sprig of basil, on account of its odor, is an agreeable addition to a bouquet of flowers.

BEANS.

Gardeners recognize three groups of beans, which are designated in catalogues and other publications on the subject of plants as—

1. Ordinary broad bean (*Vicia Faba*).

2. Bush, Dwarf, or French kidney beans (*Phaseolus vulgaris* or *P. lunatus*). Under this head is classed all those beans called by seedmen "Bunch," "Snaps," etc.

3. Pole or climbing beans (*Phaseolus multiflorus*).

The last two groups are subdivided into—

Bush lima beans (*Phaseolus lunatus* var. *macrocarpus*). There are three types under this division, viz.: (1) Sieva or Carolina, (2) flat, and (3) potato.

Pole lima beans.

Under these several heads a number of varieties have been developed by the seedmen, some of which are well adapted to Southern soils and climate.

BEAN, ENGLISH BROAD.—(*Vicia Faba.*)

The English Broad Bean is an annual from two to four feet high, with white, fragrant, papilionaceous flowers, with a black spot in the middle of the wings; seed pods thick, long, woolly within, enclosing large, ovate, flat seeds, for the sake of which it is much cultivated in Europe. It is a native of the East—some say of Egypt, but is probably from Persia, near the Caspian Sea—and has been cultivated from time immemorial.

VARIETIES.

MAZAGAN.—Sweet and agreeable in flavor, and produces well if planted early. Far the most productive variety with me. Pods contain three or four beans, which are small, oblong, and thick.

LONG POD.—Stems rise about three or four feet high. Bears well. The pods are long, narrow, and generally contain four beans of good quality. Remains in use later than the preceding.

BROAD WINDSOR.—Stems three to four feet high; pods short, but very broad, containing two beans, very large, roundish, and flattened. Best for a late crop, as it is longest in use.

Culture.—The early crops should be on a dry soil moderately rich and warm, to promote their growth during the winter. The later crops should be on a deep, strong loam. They are to be sown in drills two and a half feet apart for the Dwarf and Mazagan, and three feet for the others; put the beans four inches apart in the row, and cover three inches deep with earth, which should be pressed upon the seed. If any miss, they may be supplied by transplanting. This bean will do well wherever the winters remain open, and the mercury does not, in ordinary years, fall below about 10° Fahrenheit, and should be planted from October to February inclusive. In Virginia, and where frosts are severe, they must be put in as soon as the ground opens in spring, but they are then not as productive as when they can be planted during the months above named. No ordinary frost will injure them. When two inches high, hoe between and draw the earth about the stems of the plants. Continue this during their growth. When the plants come into bloom, take off two or three inches of the tops of the stems, which will increase the crop and hasten its maturity. The crop should be gathered before they are full grown, while they are still tender and delicate.

To Save Seed.—Allow a portion of the crop to remain until ripe. Thresh for use.

Use.—The English use these beans while young and

tender, as we do green peas. They must be cooked very young, and in the same manner; or may be boiled with bacon. They are not likely to come into general use.

BEAN, DWARF OR FRENCH KIDNEY.—*(Phaseolus vulgaris.)*

These are tender, Leguminous annuals, mostly natives of India, first cultivated in England in 1597. Of this species there are many varieties, of which the following are the best. (Those with edible pods, breaking crisply, are called snaps):

EARLY MOHAWK.—Pods long, beans large, oval, with dark-colored specks. It bears very well, is one of the earliest varieties, and is least injured by frost. In good seasons, fit for the table about five or six weeks after sowing.

EARLY VALENTINE.—Pods round, and continue crisp longer than most other varieties. The beans are pink-speckled on a salmon ground. Bears well. Sown with Early Mohawk, is about five days later.

NEWINGTON WONDER.—Very dwarf, pods of medium length, dark-green color, thick and fleshy; seeds form slowly, and the pods continue long crisp and fit for use. Seeds small, oblong, and light chestnut-colored when ripe.

ROYAL KIDNEY.—Pods long, finely flavored; seeds white and large. Sown at the same time as the Mohawk and Valentine; is a fortnight later than the Mohawk. This is one of the best for winter use when ripe.

Of Running or Pole Beans, the best are:

DUTCH CASE KNIFE, with large, broad pods, and flattish, kidney-shaped, white seeds. It is a good winter bean.

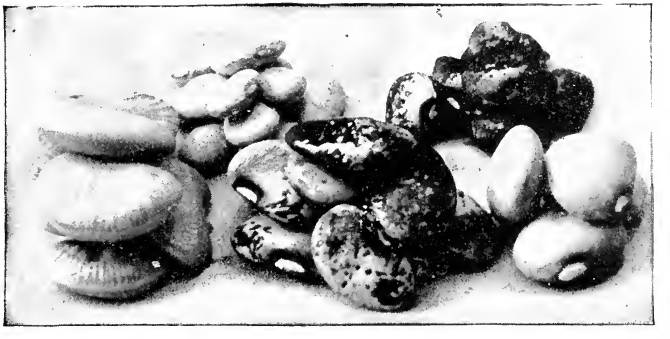
ALGIERS OR WAX BEAN is an early, running kind, with pale yellow pods, free from any tough lining, very tender

and soft when cooked; seeds medium-sized, roundish, black. Excellent, but at the South soon stops bearing.

London Horticultural is also excellent, the pods continuing tender until the seeds are quite large; the latter are large and roundish.

In Southern corn-fields are grown several excellent kinds, which are not described in our books. Three are particularly desirable, viz:

White Prolific is a medium-sized, white, oval, kid-



Kaighn. Willow-Leaf. Speckled. Black. Dreer.

Fig. 104—Types of Lima Beans. Natural size (after Bailey). Cornell Experiment Station Bulletin 115.

ney-shaped bean, with roundish tender pods, and exceedingly prolific; desirable green or for winter use.

Dark Prolific resembles the last, but the seeds are of a very dark dun color.

Black Speckled has the pods more flattened; seeds roundish, of a dull white, black speckled, and skin rather thick, but the pods are excellent to use green. Of very vigorous growth, and best endures the summer heats. Not over two plants should remain to a pole.

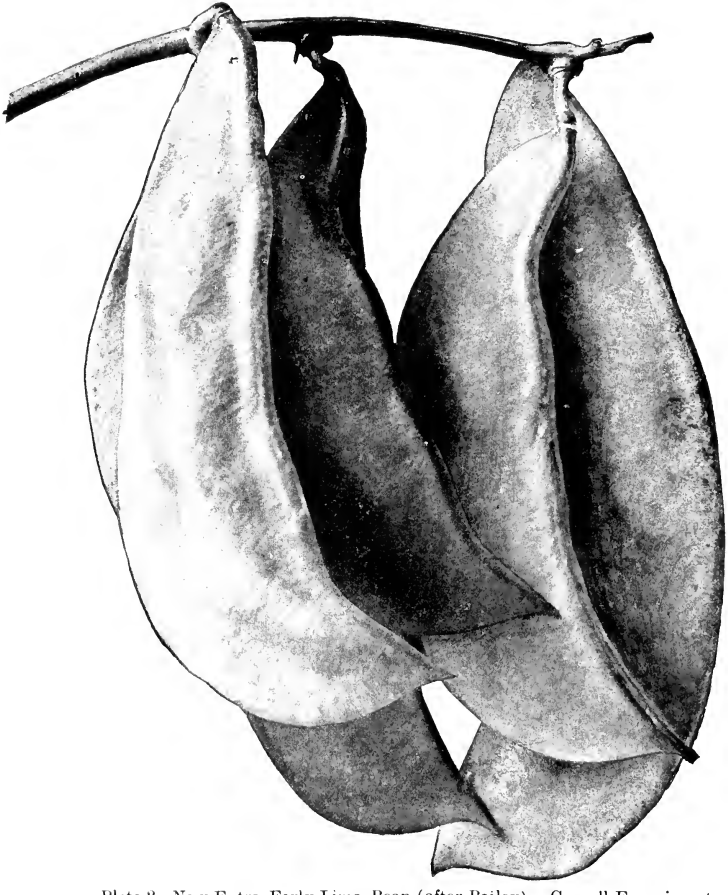


Plate 2—New Extra Early Lima Bean (after Bailey). Cornell Experiment Station Bulletin 115.

LIMA BEANS are from the East Indies. There are the green, the white, the speckled, and the small white or Carolina. The white Lima is not quite so large as the green, but, bearing with greater abundance, is to be preferred. It is also not quite so hardy and productive as the Carolina, but is much larger and richer flavored, and is the most grown for city markets.

The following varieties are also suited to the climate of the South, and are beans of excellent qualities:

BLACK-EYED WAX.—A very early and productive bean, with long, straight yellow pods.

NEW EXTRA EARLY REFUGEE.—A most productive form, improved from the old Refugee variety; but much earlier, and very prolific; excellent quality; quite tender at nearly all stages of its growth; free from strings and a favorite shipping variety.

WARDWELL KIDNEY WAX.—A dwarf variety; early prolific; pods flat and stringless, waxy yellow; hardy and productive; a good shipper.

HENDERSON'S BUSH LIMA.—This bean comes at an early period in the season, when vegetables generally are not abundant, filling a gap between peas and pole-beans. The bean is small, but very productive, bearing until killed by frost.

BURPEE'S BUSH LIMA.—A larger plant than the last, and not so early; but the pods and beans are larger, thus making this variety popular and desirable.

Carolina or Butter bean closely resembles the white Lima, but is smaller, earlier, hardier, and bears much more abundantly, and though not quite so rich, is for general culture the best running bean.

Wood-ashes and bone-dust, or superphosphate of lime, will supply the soil with the most necessary elements for

the bean crop, which, by the way, like most legumes, draws most of its sustenance from the atmosphere.

Culture.—As beans are very easily destroyed by spring frosts, there is no use in planting the main crop too early. A few of the Extra Early or Mohawk may be planted at the same time with early corn, and if there is danger, protect them when they come up, by placing wide planks over the rows an inch or two above the plants, supported

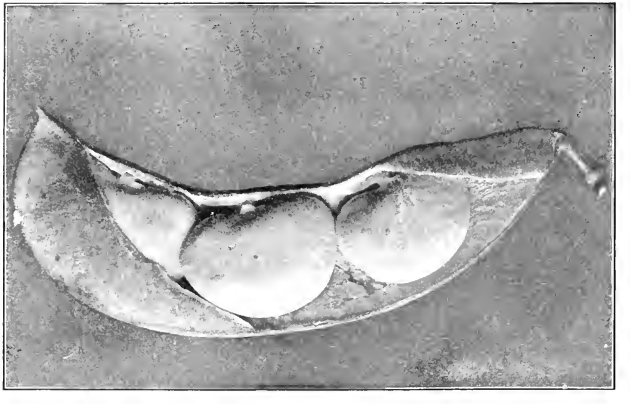


Fig. 105—Burpee's Bush Lima Bean.

on blocks or bricks, every cold night. The main early crop is planted in Georgia the last of March, or early in April; near New York city about the first of May. Planting may continue until about eight weeks before the autumn frosts occur. The soil for the early crop should be dry and light; if wet or tenacious, the seed often decays without germinating, or comes up spindling and unproductive. For the summer-sown crop, a soil slightly moist, but still inclining to a sand, is to be preferred.

Plant in drills eighteen inches or two feet apart, plac-

ing the seed two inches apart in the row. Cover the seeds about an inch and a half deep. A pint of seed will plant about one hundred and twenty-five feet of rows. When the plants come up, thin them gradually to six or eight inches in the row, and they will be much more vigorous and productive. The Late Valentine does best in hills eighteen inches apart. Plant four or five beans to a hill. Keep them always clean, and the soil light and mellow with the hoe. Draw the earth carefully about their stems when about to flower, making broad, low hills to protect the roots from heat and drought. If well cultivated, the same plants will continue to bear a long time. Do not hoe any of the kidney beans, whether dwarf or runners, when the foliage is wet, as the plants will rust and be greatly injured, if not destroyed. Choose dry weather for working them, and hoe shallow when the plants get large. The value of the crop depends greatly upon their being properly thinned in the drills while young.

Pole or running beans for snaps may be planted when the main crop of bush beans is put in, or a few days later; and at the South, a few hills should be planted monthly, until July, to give a succession, for which nothing is better than the corn-field varieties described. They should be planted in rows about four feet apart, and the hills from two and a half to three feet in the row. The hills should be broad and raised some three inches above the ground level. Put in the poles before planting, let them be uniformly about ten feet long, and inserted well in the ground. Put five or six beans around each pole, and cover them an inch and a half deep, and when up, reduce the plants to three in a hill, and where there are less than that, plant again.

Lima beans require a rich, strong soil, and will thrive on heavy loams, where the other running beans and snaps would not flourish. They are still more tender than snaps,

and should not be planted until settled warm weather, as the seed will rot in cool weather, and the slightest frost will destroy them if they chance to vegetate. The tenth of April is early enough in Middle Georgia; near New York city they plant a month later. They may be forwarded by planting in small pots in a hot-bed to be transferred, by breaking the balls, to the open ground when three inches high. Lima beans will not thrive if too much crowded; the rows must be five feet apart, and the hills three feet in the row. The space between may be cropped early in the season with Irish potatoes, etc. When the plants begin to run, give them a little assistance, if not inclined to cling to the poles. If these are too high, the vines are later in bearing, and the crop out of reach in gathering. When they blossom, pinch off the tips of the leading shoots, to hasten the maturity of the crop.

In planting Lima beans, place the eye downward and the narrow end the lowest, as the bean always rises from the ground in that position, and if not planted right, it has to turn itself over in the soil, and if prevented by any obstruction from turning over, it is sure to rot in the ground. Planted in this way, they come up sooner, better, and more evenly. A quart will plant about four hundred hills. The subsequent culture consists in keeping the ground frequently hoed when the vines are dry. They will continue in bearing until cut off by the hard frosts.

For Seed.—Gather both the Lima and kidney beans when ripe and dry them thoroughly. The seed should be kept pure by planting the varieties at a distance from each other. Where subject to be destroyed by bugs, instead of using paper bags, put them up in glass bottles or earthen jugs well corked. Into each bottle or jug pour, before corking, a teaspoonful of spirits of turpentine. The

turpentine odor will destroy the bugs, if the vessel is tightly corked, without injuring the vitality of the bean.

Use.—The tender, fleshy pods of snap-beans are a favorite summer vegetable, very delicate, wholesome, and moderately nutritive. They are boiled while green, and may be preserved for winter use, by cutting them into pieces and laying them down in salt. They will make their own brine, and must be kept covered by it, or they will spoil. Cook in two waters to extract the salt. The Lima beans, and the snaps also, when full grown, are shelled, and may be preserved for winter use, and afford in proportion to their weight, more nutrition than most other vegetables. Wheat contains but 74 per cent. of nutritive matter, while kidney beans contain 84 per cent. They abound in the constituents that produce muscle and fat, and will supply better than most vegetables the place of animal food. Gather them in their green state when full grown, and dry them carefully in the sun. They are better gathered thus than if delayed until ripe, and are also free from bugs. Soak them over night before being boiled. They can also be laid down with layers of salt like snap-beans. They are very good gathered when ripe, and dried carefully in an oven in order to keep them free from insects, which, at the South, are quite destructive. Snap-beans are also pickled, while young, in the same way as cucumbers.

MARKETING.—The beans must be picked when the dew is dried off the pods, so that there will be as small amount of moisture present in the packages as possible. And inasmuch as there will be more or less shrinking, the beans are exposed to the air in the packing house an hour or more, so that the packages will be full when they reach their destination. An ordinary vegetable crate is used in which the beans are regularly laid and well shaken down in order that the packing will be firm.

BEET.—*(Beta vulgaris*, and *B. Cicla.)*

The COMMON BEET (*Beta vulgaris)* is a biennial plant, a native of the sea coasts of the south of Europe, and is said to have been cultivated for its beautiful red roots long before its edible properties were discovered.

It was introduced into England by Tradescant, in the year 1656. Its name is said to come from the resemblance of its seed to the letter *Beta*, of the Greek alphabet.

The best varieties are the following:

EXTRA EARLY TURNIP, OR BASSANO BEET.—The root is oval; color, pale red. Downing truly says "it is the sweetest, most tender, and delicate of all beets"; but the color boils out, so that it is not as beautiful as some others; yet it is the best early beet and one of the easiest grown.

EXTRA EARLY EGYPTIAN BEET.—This was a great favorite among market gardeners several years since. It is of fair quality, flat in shape; of a deep red color, and a small top. It soon loses its flavor and becomes woody.

EARLY ECLIPSE BEET.—A smooth, round beet and of intense red color, with small top; fine grain, sweet, and delicate flavor. The heavy crop it produces and its many fine qualities make this beet desirable for gardens.

For later crops there are several varieties among the Blood turnip beets which yield excellent results. The following represent the best:

LONG BLOOD is the kind most grown for winter use. It grows a foot or more in length, and four or five inches in diameter, mostly beneath the earth. It is a good keeper and very sweet.

EARLY LONG BLOOD resembles this; but about half the root is above ground, and if not gathered and stored early, is more exposed to injury from frost.

Besides the above, a few other varieties are grown in

portions of the South, and are strongly recommended by gardeners because of certain desirable qualities. One of the best of these is

LENTZ BEET.—Early with dark blood-red flesh; tender and sweet.

The beet has been grown extensively in this country and abroad for the sugar it contains. A large proportion

Fig. 106—Klein Wanzleben. Sugar Beet.

Fig. 107—Mammoth Prize Long Red Beet (Manzel-Wurzel).

of the sugar of the markets of the world now is produced from certain varieties of the common garden plant, which have been carefully improved by selection and culture, until pure strains have been produced and well estab-

lished. The external form and color of the beet indicate these distinguishing characteristics. The fine flavor of these sugar beets also make them excellent for table use. The two varieties generally cultivated in this country are Klein Wanzleben and Vilmorin Improved.

Culture.—The beet, being a native of the sea-shore, abounds in soda, which can be supplied, when deficient, by an application of common salt the autumn before planting. This, and leached or unleached ashes, will afford nearly all the inorganic elements of the crop. A top dressing of nitrate of soda is excellent. But care must be taken not to let the chemical come in contact with the foliage.

The main summer crop of beets should be planted when the peach and plum are in full blossom. A few Bassano or Early Turnip should be planted a few weeks earlier, and of other kinds successive beds may be made whenever the soil is in a suitable state, from January until the summer droughts come on. Advantage should be taken of the rains that usually occur about the last of July, or early in August, to put in a crop for winter. This crop should be put in earlier the farther northward the locality. At New York, the main crop is planted as early as the middle of June, about three and a half months before killing frosts. This last planting often proves a failure in the dry autumns of a Southern climate. It generally will succeed in rich, fine soil.

When the surface soil is rich and the bottom poor, it will be difficult to make the beet, carrot, and other tap-rooted plants produce fine, smooth roots. This difficulty will cease if the ground be deeply and thoroughly worked, mingling the soil and making it uniform throughout, and taking care to place at the depth of one foot below the surface a layer of good manure.

The best beets grow in sandy bottom lands, but any soil

will answer for them if deeply and thoroughly worked and well manured. This is necessary with all tap-rooted plants, and especially with the beet. Beet seed is somewhat slow in vegetating, and the later sowings may be soaked in water twenty-four hours before planting, and the drills well watered upon the seed, which is then covered with light soil pressed gently upon the seed—a good method of planting all summer crops. Make the beds four or four and a half feet wide, for convenience of cultivating; spade them up at least a foot deep—eighteen inches is still better; mix in a good supply of well-rotted manure throughout, if the ground requires it. Rake the ground even and smooth, and mark out the rows twelve inches apart across the bed; draw the drills an inch and a half or two inches deep, in which drop the seed two inches apart, and press the earth gently upon it. When the plants are up, thin them to eight or nine inches apart, fill any vacancies by transplanting, and keep the ground around them loose and free from weeds until matured.

In planting crops of beets, carrots, and parsnips, particularly the two latter, sprinkle *a few* radish seeds, if you like, and the ground is rich, in the rows to distinguish them. The radishes will be up in a week, and the ground can be hoed or weeded without any danger of destroying the young plants. Drills can also be made between every two rows of beets, making a drill every six inches, which can also be sown with radishes or lettuce plants, which can thus be grown abundantly between other crops without loss of room. But a rich soil is required to bring forward both crops to perfection.

For early beets it is well to prepare a good bed under glass in which the rows should be marked out a foot apart. The ground should be deeply spaded and thoroughly manured. Mark out your rows for the beets, and between the first two draw a drill in which you can sow

your Early York cabbage; between the next two you can raise all the Butter-lettuce you wish to set out for heading. In the rows of beets themselves, you may sprinkle a few radish seed; then a row of later head-lettuce, tomatoes, egg plant, peppers, etc. The drills retained for the beets should be sown in this climate with the Bassano beet about the tenth of January. By the time the hard frosts are over, the beets, cabbages, etc., will be fit to transplant. Thin out to six inches apart, planting out those pulled up in the open ground. In transplanting the beet, a deep hole should be made with a dibble, and the root not bent. Those that remain in the bed will soon come into use, and by the time they are gone, the transplanted ones will come on for a succession.

The winter crop should be secured as soon as the first killing frosts occur, as the sweetness is lost by remaining in the soil. The roots should be taken up, dried a little, and stored away in casks with layers of dry sand, where they will keep in good condition until spring. The mangel wurzel beet is much cultivated in some countries for feeding stock, and is very good for the table when young and tender, but in our long season it loses its sweetness before winter. Here the sweet potato, rutabaga, and other turnips are more promising.

THE SWISS CHARD, OR WHITE BEET (*Beta Cicla*), is also called the Sea Kale Beet. There are two varieties—the white and the green—which receive their names from the color of the foot-stalks of the leaves. Either of these is good. The plant very much resembles the common beet, but the leaves and their stalks are much larger, thicker, more tender and succulent, and less capable of resisting frost.

The root of this plant is small, coarse, and of no value; only the leaves and their stalks are employed, especially the latter, which are cooked and eaten as asparagus.

The culture is exactly the same as the common beet, except the plants should be twelve or more inches apart. The soil may be richer and not so deep, and the plants are more benefited by copious watering, especially with liquid manure. For winter use, the leaves may be covered with litter. They will afford blanched leaf stalks all winter. If the soil be moist and kept mellow and free from weeds, it will yield bountifully. Salt is a beneficial manure for this crop, applied while preparing the ground, as it keeps it moist. It is singular that a plant of so easy culture, and yielding during the entire season after May a supply of the most delicate greens, has not come into more general cultivation

Fig. 108—Swiss Chard.

For Seed.—Select a few of the finest-looking roots — those smooth and well shaped. Plant the different varieties as far apart as possible; indeed, it is better to save the seed of only one kind the same year for fear of intermixture and degeneracy. Keep them free from weeds, and tie the seed stalks to stakes to support them. Gather and dry the seed as soon as ripe, and put away in paper bags. Keep dry, and they will be good for ten years.

Use.—The young and tender tops of the common beet, and the leaves and stalks of the chards, are boiled as sum-

mer greens, or of the latter the midrib and stalk may be peeled and boiled separately from the rest of the leaf, and prepared as asparagus, for which they are an excellent substitute. In gathering, the largest outside leaves should first be taken, and the inner ones left to increase in size, taking care to gather them while still perfectly green and vigorous.

When common beets are thinned, the young beets pulled up, if cooked, tops and bottoms, are very sweet and delicate. When well grown, the roots give an agreeable variety to our table vegetables, being tender, sweet, and considerably nourishing. They also make an excellent pickle. If eaten moderately, they are wholesome, but in too large a quantity produce flatulence and indigestion.

MARKETING.—The roots are pulled when not quite grown, at a period when they are crisp and tender. The tops are cut off about two inches from the root, because if cut too close the beet will lose much of the moisture before it reaches the market, and its quality will be greatly impaired. With some gardeners the practice is to tie four of the roots together in a bundle and thus ship to market the first three weeks, but as the season advances the beets vary in size, and then the bunching is discontinued, and the roots are packed in well-ventilated barrels or bushel baskets.

BORECOLE.—*(Brassica oleracea, fimbriata.)*

This plant, known also as Kale and German Greens, is the easiest cultivated, and one of the most valuable of the cabbage tribe. It has large curled or wrinkled leaves, forming an open head, and such a hardy constitution that it resists the severest frosts, which serve only to improve it. It remains green and eatable all winter without the least protection at the South, and in the Northern States requires only a slight covering. The best varieties are:

EARLY CURLED SIBERIAN, OR DWARF GERMAN GREENS. Beautifully curled, and known in some sections as Blue Curled Kale. Very hardy and makes excellent greens for winter and spring use.

DWARF GREEN CURLED SCOTCH is a fine winter kale, and is superior for home use. After frost the leaves become very tender, and produce greens of fine flavor. The plants grow from two to two and a half feet high, with an abundance of beautifully curled leaves.

Culture.—Raised from seed, like the rest of the cabbage tribe, which may be sown in April with the winter cabbages and treated in the same manner. Transplant, if the Dwarf Green Curled, into rows eighteen inches apart and twelve inches in a row. Give it a good soil. The other sorts require about the same space as winter cabbages. Borecole may be sown as late as the middle of August in the place where it is to remain, and managed like the rutabaga turnip. Like the cabbage, it is visited by the aphis or cabbage-louse, and caterpillar.

Seed.—Manage some of the best plants as cabbage.

Use.—The outside leaves can be cut off for use when from seven to nine inches long, but they will be coarse and rank until mellowed by frost. The better way is after frost to cut off the hearts, not square across, but with a sloping cut, in order to throw off the rain, and the stem which is left will throw up fresh sprouts for a succession. For winter and spring greens this vegetable is nearly equal to the Savoy cabbage, after the frost has rendered it sweet and tender.

MARKETING.—Barrels, well ventilated, are used for shipping this vegetable to market. The kale is cut when the leaves are seven to nine inches long, and securely packed, so the barrel will remain full when it reaches its destination.

BROCCOLI.—*(Brassica oleracea, var. Botrytis asparagoides.)*

This is a cultivated variety of the cabbage resembling cauliflower, from which it differs in its undulating leaves, its larger size, and the color of some of its varieties.

It is supposed to have originated from the cauliflower; it is a hardier plant, but not so delicate in flavor. It has been cultivated about two hundred years, and was introduced into England from Italy. Broccoli is raised more easily than cauliflower. The Early Purple Cape broccoli, producing large, brownish heads, very close and compact, is the best of over forty sorts.

It requires the same special manures as cabbage and cauliflower, and for cultivation sow, transplant, and manage like late cauliflower. To protect from insects see Cabbage.

Use.—The same as cauliflower, to which it is inferior, and where that succeeds will hardly be worthy of culture.

MARKETING.—Cut off most of the leaves around the head and pack in vegetable crates.

BRUSSELS SPROUTS.

(Brassica oleracea, var. bullata gemmifera.)

This plant is a hardy variety of the Savoy cabbage, producing an elongated stem, often four feet high and crowned with leaves similar to the Savoy. Small, green heads like cabbages spring from the axils of the stem leaves, which, dropping off, leave the little heads arranged spirally around the stem as the plant proceeds in growth. Brussels Sprouts are raised from seed, which may be sown in April. Set the plants in rows two feet by one and a half feet apart, and treat in all respects as directed for winter cabbage. Cut off the leaves at the top of the stem some ten days or a fortnight before the little heads are gathered, and use for greens.

It will stand the winters without protection south of

Virginia, but the product is rather small, and the plants are very subject to the aphis during the winter.

The BEST FRENCH or ROSEBERRY is the variety generally planted in the South.

For Seed.—Cut off the top of the stem and permit the flower stalks to spring from the little heads only. Keep at a distance from all the other varieties of Brassica, in order to have pure seed.

Use.—The top boiled for winter greens is very delicate in flavor and similar to the Savoy. But the little sprouts after they have been touched with frost, which very much improves them, are the parts most used. The sprouts are fit for use all winter.

MARKETING.—See Borecole.

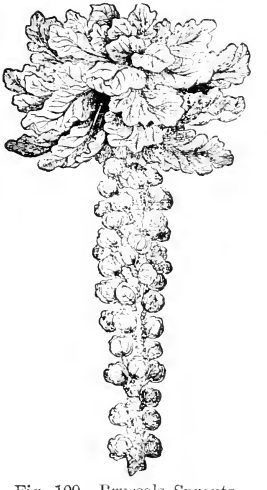


Fig. 109—Brussels Sprouts.

CABBAGE.

(Brassica oleracea, var. capitata.)

This is a Cruciferous biennial plant, quite hardy, found wild on the coasts of England, France, and many other parts of Europe. The wild variety is known as Sea Colewort, bears but a few leaves, and is far from palatable, unless boiled in two waters to remove its saltness. The cultivated variety was probably introduced into England by the Romans, and the common name doubtless comes from the Latin *Caput*, or head. This is one of the most useful crops in cultivation. Cabbages are eatable almost from the time they leave the seed-bed until they have acquired a hard, close head; and they can be raised on

every bit of otherwise idle ground. They can be planted between beds and rows of anything and everything, to be eaten as greens when young, or left to head on the coming off of other crops, and if there should be a superabundance above the wants of the family, nothing is better for the cow and the pig. When the seed are carefully selected and the strains are preserved, the American seeds are superior to the imported, and produce finer and larger heads. No seed for late cabbage is better than our own, if saved from fine, large heads. But all the late cabbages in hot climates, without proper care, are prone to run into coleworts or "collards."

The best varieties are as follows:

EARLY JERSEY WAKEFIELD.—This cabbage has taken the place in recent years of the Early York, which for

Fig. 110—Early Jersey Wakefield Cabbage.

many years was the best for the earliest crop. The Wakefield is a conical headed cabbage, and the outside foliage permits of close planting, so that a large crop may be produced from an acre of ground. There is a larger

headed variety of the Wakefield called Large Early, or Charleston Wakefield, but rather later in maturing.

EARLY WINNIGSTADT.—Stem dwarf, head large, broad at the base, sharply conical, heart firm, boiling tender; sown late, it proves a good winter cabbage; adapted to

Fig. 111—Matchless Late Flat Dutch Cabbage.

sandy soils; about three weeks later than the early varieties.

HENDERSON'S EARLY SUMMER.—This cabbage comes in just after the Wakefield, and its large, well-shaped head stands the summer's heat finely.

EARLY FLAT DUTCH.—This is an old standard variety and well suited to Southern portions of the country, be-

cause it has considerable heat resisting properties. The heads are flat on top, and of large, uniform size.

ALL SEASONS.—This cabbage is good for fall, winter and summer planting. The heads are large, and come into use nearly as early as the Early Summer.

EXPRESS.—Four or five days earlier than the Jersey Wakefield. The heads are exceedingly firm and well shaped.

EARLY DRUMHEAD.—The heads are large and firm, and withstand the heat admirably, thus making it a popular cabbage in many sections of the South. It matures about ten days later than the Wakefield, and is therefore an excellent cabbage to follow that variety, especially the Charleston Wakefield.

LARGE EARLY YORK.—Is robust, bears the heat well, and will often continue in eating all summer.

FOTTLER'S IMPROVED BRUNSWICK AND SUCCESSION are fine plants and much alike.

For late cabbages the following are well suited to the South:

PREMIUM FLAT DUTCH.

LARGE LATE DRUMHEAD.

RED DUTCH is used principally for pickling, and should be sown at the same time with the drumheads.

SAVOY CABBAGES.—*(B. oleracea, var. bullata-major.)*

These differ from the preceding in their wrinkled leaves. The varieties are hardy, being rendered more sweet and tender by frost. The only two worthy of culture are:

CURLED SAVOY.—An excellent winter variety, much improved in sweetness and tenderness by frost. It does not head firmly, but is very fine flavored, and even the outside leaves are tender and palatable.

DRUMHEAD SAVOY is almost as large and firm as the

drumhead cabbage, and keeps very well. The head is round, flattened at top. It is nearly as delicate as the curled variety.

The Savoys are not as certain a crop as the other cabbages, but far superior in delicacy. They are nearly equal to cauliflowers.

Culture.—An analysis of different varieties of the cabbage shows them all to contain a very large proportion of

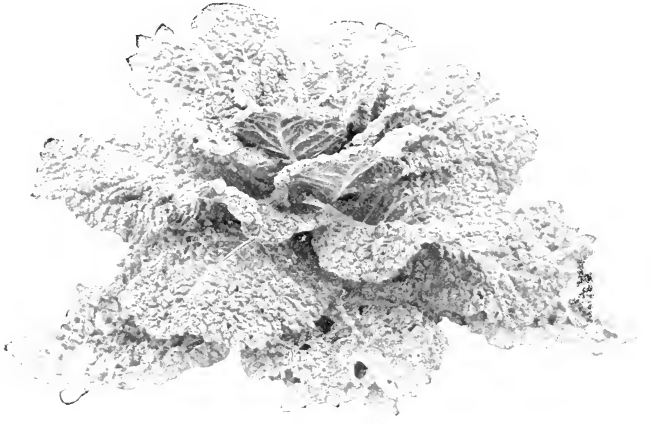


Fig 112—Savoy Cabbage.

nitrogen; after evaporating the water, drumhead cabbage gives of nitrogen 17.899 parts in a hundred; Savoy, 20.763; red, 16.212; turnip-rooted, 19.052. We also find this plant remarkably rich in phosphorus and sulphur; hence its unpleasant smell in decay, like that of animal matter. It abounds also in soda and potash. Hence, common salt, to yield soda and chlorine, wood ashes for potash, bone for phosphoric acid, and gypsum, to add sulphur and lime, together with a soil saturated with manure of animals, especially the liquid excretion, all come in play in making

fine cabbages. Frequent stirring of the soil will also rob the atmosphere of its ammonia for the same purpose.

The genus to which the cabbage belongs (*Brassica*) embraces also the Turnip, Borecole, Broccoli, Cauliflower, Brussels Sprouts, etc., and the following observations apply to the whole of them.

For the seed-bed the soil should be a moist loam, but more dry in the case of plants which are to stand the winter. For final production most plants of this genus like a fresh, very rich, moderately clayey loam. A moist, cool bottom suits them admirably; such of them as are to stand the winter in the open ground should be grown in a lighter soil, not over rich. Good, well-decomposed stable manure is usually employed in preparing the soil for this genus. Pure hog manure is by some considered objectionable, as it is said to cause any of the cabbage tribe to become clump-rooted and lose their regularity of shape. A plentiful application of salt the autumn before planting, say at the rate of eight or ten bushels per acre, is very beneficial to this tribe, as it destroys the cut-worm and keeps the soil moist and cool. Bone-dust, and especially super-phosphate of lime, has a very surprising effect upon them, far more than analysis would lead one to suppose.

The ground is advantageously dug twice the depth of a spade, and should be well pulverized by the operation. All of the cabbage tribe are particularly benefited by frequent and deep cultivation; they especially like to have the soil about them thoroughly worked *while the dew is on them*. There will be a very great difference in the growth of two plots of cabbages treated alike in other respects, one of which shall be hoed at sunrise, and the other at midday; the growth of the former will surprisingly exceed that of the latter. But the cabbage tribe cannot be hoed too much for their benefit even if daily.

The situation must be open and free from all shade or drip of trees; if shaded from the midday sun, it is an advantage, but it must not be by trees. In the shade of trees and other confined situations, they are much more subject to be infested with caterpillars, and to grow weak and spindling. In planting out, all that have knotted or clumped roots should be rejected.

Cabbage seed may be sown early in September or October in the open ground, watering in the evening when dry, as it usually is this month. The seed should be sown in drills, six inches apart, and one inch deep, and the ground deeply dug; water the drills before covering the seed, unless the ground is moist. Cover with fine, rich soil, pressed lightly upon the seed. The plants will appear in about a week. When large enough to transplant, they can be set very thick in a cold frame or box, to stand over the winter. Cover over with glass, or boards if you have not glass, during severe weather, but give air every mild day, and set out when the weather grows mild in the spring.

From Washington southwards, a still better way than putting the plants in a frame, is to throw a piece of ground into high ridges, two feet apart, running east and west. On the south side of these ridges set out the plants a foot apart, so that they will be shielded from the cold north winds, and enjoy the full warmth of the sun. Plant on the sides of the ridges and not in the trench. When the weather grows severe in December, cover slightly with straw or litter; remove it when mild weather returns, and cultivate as usual, gradually levelling the ridges, and you will have cabbages earlier than by any other mode. The ground should be good. If you raise your plants in the cold frame, they will be ready to transplant from the 20th to the last of February. They will be very liable to be eaten off by the cutworm when trans-

planted. There are two modes of preventing this. The best method is to sow the ground intended for cabbage, the autumn after being spaded up, with salt at the rate of eight bushels per acre. If you have not already sown your cabbage plot with salt, there is another plan to keep off the cutworm, equally successful. Throw your ground into ridges and trenches sixteen inches apart; let these trenches be at least six inches deep. In the bottom of these transplant your cabbages, one foot apart. Some use a dibble, but a trowel is much better, as it does not leave the soil hard. Prepare your ground in dry weather, but choose a moist day for transplanting. It is a good plan to wet the roots before planting out. When they get rooted, stir the soil gently about them, but do not fill up the trenches until the plants are so large that there is no danger of the worm. This method of protecting cabbages was pointed out to me by a negro gardener several years since, and I have tried it repeatedly. The worm will not go down into the trenches to destroy the plants.

Mr. Weed, entomologist of the Mississippi Experiment Station, makes an excellent suggestion for destroying the Harlequin or terrapin bug. He recommends the planting of mustard between the rows of cabbage. The bugs will gather on the mustard in preference to the cabbage, and the plants can be pulled up and burned, or the mustard may be sprayed with pure kerosene.

When the plants get strong the ground should be deeply and repeatedly hoed. Do this while the dew is on, and retain its ammonia in the soil. The cabbage is partial to moisture, so hoe it frequently, and when you go out in the morning, you will find the plot moist with dew, while the unstirred soil around is dry as ever. The only secret in raising early cabbage is, set your plants in rich ground and *stir the soil.* On poor ground (and even on

rich, if half tended) they will run into collards. *Stir the soil*, and less manure is required.

If the fall sowing has been neglected, sow the seeds in January or early in February in a cold frame, as directed in the article on the Beet; or they may be sown in the open ground when the heavy frosts that freeze the soil are over, and covered with litter, if protection is needed against unseasonable frosts, to be removed when the danger is over. Transplant and cultivate as above.

For the middle crop to last through the summer, the seed can be sown as above, or at any time until the middle of April. The cultivation is the same, except that the plants should be set about sixteen to eighteen inches apart. The varieties will not head unless the ground be rich, rather moist, and, above all, diligently worked.

Sow the late crop about the first of April. It is sown the first of May near New York, but, sown at that season in the South, it is not certain to come up. If seed of any of the cabbage tribe be sown after the weather grows warm, it must be watered in the drill, or covered with rich, fresh earth, which must be pressed upon it by walking on a board, and it must be shaded by a covering of boards or pine brush during the day, removing it at night, until the plants get a little established. If the weather is warm and wet, the covering may be dispensed with. They should not be transplanted until July or August. Let the ground be well spaded, and thoroughly manured. The plants must be *set in the ground up to the first leaf, no matter how long the stem may be*, or they will not head. They also require a rich soil, but not from fresh manure. The manure for the cabbage crop should be thoroughly decomposed, or the plants will be covered with aphides or cabbage lice. The best way is to throw the ground into ridges from two to two and a half feet apart, making the trenches between more or less deep, according to the

length of the stems; wet the roots thoroughly, and transplant in moist weather, doing it carefully with a trowel, and when the ground gets dry, draw the earth level, which should just reach up to the lower leaves, not all at once, but gradually. If you have not late plants, sow Large Yorks or Winnigstadts, in July here, or June northward, and good heads of a smaller size can be produced.

The soil for cabbages cannot be made too rich. The plants demand a large supply of nitrogenous manure. The application of lime once in five years will repay the gardener.

After the late cabbages are transplanted, let them be well cultivated by deep and frequent hoeing, and do not strip off the lower leaves if you wish them to head.

To Preserve Cabbage.—Heel them up to their lower leaves in a dry situation, on the north side of a fence or building, and cover slightly with plank, straw, or pine brush, to keep them from freezing and thawing during the winter. It is not the frost, however, but the sun upon them, while frozen, that does the injury. In Virginia and northward, dig a trench on a gentle slope, and lay two or three bean poles in the bottom; on these, beginning at the upper end, lay the cabbages, head downward, a little sloping, so that the water may run out from the heads. Cover now with earth a few inches thick, forming a sharp ridge about their roots, which should be made firm by treading or beating. Begin at the lower end and dig out as wanted for use.

Seed.—Set out some of the best *heads* in the spring at a distance from turnips and all other members of this family, or they will intermix. Of the late varieties, home-grown seed, if pure, is the best. Support the stems as they rise by stakes, and gather the seed before it scatters. Seed will keep four years.

Use.—Cabbage, as an article of food, is not so remark-

able for its fattening properties as for its power of supplying strength for labor by producing muscle and bone, which it owes to its richness in blood-forming material, abounding in nitrogen, phosphates, and sulphur. Hence it is very nutritious for, and much relished, by laboring people in all parts of the world, but is apt to disagree with those of quiet and sedentary habits. *With the latter it is more wholesome and digestible if eaten uncooked.* Many persons can eat "cold slaw" with impunity that are unable to use boiled cabbage without great inconvenience. It is by many much relished when made into sauer-kraut. It is also pickled.

MARKETING.—In gathering the cabbage care must be exercised in the selection of those which give firm heads. Most of the outer leaves are taken off, just a few being left to prevent the head bruising in transportation; the stem is also cut off close. Barrels are generally used in shipping with stout cloth tied over the end and several holes cut in the sides to give sufficient ventilation. The cabbage should be packed strong and securely in the barrels, using considerable force, so that there will be no displacement in transit, and the chances for bruising will be reduced to a minimum. It is unwise to pack different varieties in the same barrel; separate the varieties as well as assort the sizes and better prices will result when the shipment reaches market. Crates are used in some sections of the South for sending cabbage to the market, but they do not seem to give as good satisfaction as do the barrels.

CARROT.—*(Daucus Carota.)*

The carrot is a hardy, umbelliferous biennial, found wild in Great Britain, as well as in this country, growing in sandy soil or by road-sides. The root of the wild plant is small, white, dry, woody, and strong flavored; while

that of the cultivated variety is large, succulent, and generally of a reddish yellow or pale straw color. The cultivated carrot is, however, thought to have been brought into Europe from the island of Crete, where it was early cultivated. It was carried to England by Flemish refugees in the days of Elizabeth, and the leaves were thought beautiful enough to be used in ladies' headdresses. Cultivation has changed a wild, worthless plant into a most nutritious root.

Fig. 113—Rubicon Half Long Orange Carrot.

M. Vilmorin, of Paris, has done the same in our day, and from the wild plant by selecting seed, in three generations produced roots as large as the best garden carrots, the flavor of which, by most of those who have tasted them, is considered superior to the old varieties. (*Bon Jardinier.*)

The best varieties for the garden are:

EARLY HORN, which is very early, high colored, and sweeter than other varieties. It does not grow very long, and may be known by its conical root shortening abruptly to a point. It will grow closer together, and is better on shallow soils than other kinds, except

EARLY FRENCH SHORT HORN, which is an earlier and superior variety of the above, and for an early crop the best.

ALTRINGHAM.—Color, bright red, and growing with the top an inch or two above ground, which sometimes

freezes in very severe winters, if left in the ground, as is usual with this crop in Southern gardens. Of excellent quality.

LONG ORANGE.—Is paler in color, and of great length, the root not above the ground. It is next in quality to the above, and best for winter use where the crop is to be left in the ground.

HALF LONG DANVERS.—Of good quality; thick root and very productive. One of the most popular kinds among gardeners. The color is bright orange.

Analysis shows that lime, potash, soda, sulphuric acid, and chloride of sodium or salt abound in the ashes of this plant. The salt and lime mixture, composted with leaf-mould or swamp muck, a little plaster of Paris, bone-dust, and wood ashes, are the special manures needed.

Culture.—Carrots like a light and fertile soil, dug full two spades deep for the long varieties, as they require a deeper soil than any other garden vegetables. The manure should be put as near the bottom as possible, not less than eighteen inches from the surface; but the soil should be fertilized by a previous crop, if fine, smooth roots are desired.

In the Southern States carrots, for the early crop, may be sown in October or the first of November, and again from January to April inclusive, after which the seed comes up badly. At New York, the late crop is sown in June for winter use, and for the early crop they sow in September, and protect it a little with litter through the winter.

Late-sown seed do not vegetate freely. Sow in drills fifteen inches apart; cover the seed half an inch deep with fine soil, and for the late crop, if the ground is dry, water the seed before covering, and after a few hours press the earth upon the seed with a roller or plank. Thin the young plants to six inches apart. In short, the culture

of the carrot is just that of the beet. Six hundred bushels have been produced from one acre. The carrots need not be pulled at the South, but may be left safely in the ground to draw as wanted for use during the winter. In severe weather, they may be protected by a covering of litter; but it is hardly necessary, except for the Altringham. At the North, they are stored in cellars or in piles, covered with straw and earth, like the potato.

For Seed.—Leave some of the finest roots, protected with litter, where raised, to blossom and seed the next summer; save only the principal umbels. Each head should be cut as it turns brown, dried in the shade, rubbed out, and dried in paper bags. The seed will not vegetate if more than two years old.

Use.—The carrot is a very wholesome food for man or beast. It is a valuable addition to stews and soups, and is also boiled plain, pickled. Boiled or grated, it is an excellent poultice. The grated root is often added to cream to improve the color of winter butter. One carrot, grated into cold water, will color cream enough for eight pounds of butter, without any injury to the flavor. One bushel of boiled carrots and one of corn are said to be worth as much as two bushels of corn to feed to pigs. They are excellent for feeding horses and milch cows, and for this purpose are the most profitable of all roots in deep, fertile soils.

MARKETING.—The roots should be well washed and tied in bunches of six and neatly trimmed. Pack in crates securely to prevent movement in shipping and thus bruising.

CAULIFLOWER.—*(Brassica oleracea, var. botrytis.)*

This plant is a biennial, and was introduced into England from the Island of Cyprus, in the early part of the seventeenth century. It is a kind of cabbage with long,

pale-green leaves, surrounding a mass or head of white flower buds—in short, "a giant rose wrapped in a green surtout," but much more like a mass of fresh curds than a rose. Since its introduction, it has been much improved by the skill of the gardener. The seed is generally imported from Europe.

There are several varieties, of which Early Erfurt and Snowball are the best.

Cauliflower requires the same manures as cabbage. There is much less difficulty in its cultivation near the sea shore than inland. The ground should receive a dressing of common salt.

Culture.—Cauliflowers are sown at two periods for the early and late crop. For the former sow early in September thinly in drills six inches apart, in rich, light soil, and if the ground is too dry and hot, water the seed in the drill before covering; cover with fine, light soil, and shade with a mat until the seeds are just *beginning* to come up (not longer). When the plants are three inches high, in the colder localities, they are taken up carefully and potted singly in small pots, three in a pot where the quart size is used. Instead of potting, they may be set out in a cold frame or pit four inches asunder, to remain until spring opens, giving them meanwhile all the air the weather will admit to harden them. They will stand light frosts without injury. As early as safe, remove the sashes entirely a few days, take them up from the bed with a transplanter with balls of earth, or, if in pots, divide the ball carefully if it contains more than one plant, and set them out in very rich ground twenty by twenty-four inches apart, inserting their stems in the earth nearly to the first pair of leaves. Shield them with plant protectors from heavy frosts.

In milder localities, as the coast and middle section of the more Southern States, the plants, when taken up, are

set out in rows where they are to remain, four inches apart in the row and the rows four feet apart; they are protected during frosts and heavy storms by hoops and mats, or by a covering of four planks a foot wide to each row. These are supported by rafter-like supports, every five or six feet, to which one of the planks is nailed on each side, while the others are movable and are taken off in all mild weather. The ends are closed with plank. Instead of plank, white cotton cloth, prepared with linseed oil, affords a suitable covering. They must have air and light at all times when practicable. Slugs must be watched, whether wintered thus or in a hot-bed. They may be driven off by sprinkling the soil and plants with quicklime. As early as may be safe in February, prepare the soil between the rows, which, during the winter, should have been protected from treading by a coat of leaves, or a few old plank, and plant another row therein with the plants twenty inches apart. Thin the plants that were wintered to twenty inches, taking them up with a transplanter, and plant out those not required for the intermediate row in a plot prepared for the purpose. Shade a little with plant protectors until established, if there is danger of their flagging; afterwards cultivate them as cabbage.

For the late crop sow in the manner above directed at the same time with winter cabbage, from April to July. An ounce of seed will yield three or four thousand plants. The seed-bed should be of light, rich soil, and when the plants are two or three inches high, they should be taken up and set out in a bed four inches apart, shading them until again established, or, if the weather is too dry and hot, thinned to that distance in the seed-bed. They should be taken up with balls of earth in a transplanter and planted out at the same time with winter cabbage, in rows twenty by twenty-four inches apart. Protect them

from the cutworm and insects in the same manner. If possible, give them a plot of moist bottom soil, made very rich with well-decomposed manure. Water freely when needed, which, in dry weather, is every other day at least; if with liquid manure, so much the better. Let them never suffer from drought; they will show when they need water by their drooping leaves. Soapsuds is an excellent application. Keep the ground hoed thoroughly about them, especially the day after each watering, that it may not bak

The hills should be hollowed about the cauliflower like a shallow basin, to retain moisture. The head may be blanched by bending the leaves and confining them loosely with a string. They will head in succession during the autumn. On protection from insects, see "Cabbage."

When a cauliflower has reached its full size, which is shown by the border opening as if about to seed, the plant should be pulled, and if laid entire in this state in a cool place, may be kept several days. It should be pulled in the morning, for if gathered in the middle or evening of a hot day, it boils tough. When there is danger of severe frost injuring the cauliflowers that have not already headed, they may be protected by pine boughs or empty boxes or barrels where they stand, or pulled up with the earth attached to the roots, and removed to a cellar or out-building, where they will flower in succession. In the low country this will hardly be necessary. The spring crop is, I believe, more certain in low sections.

For Seed.—Set out, in spring, some of the finest heads, with fine, close flower-buds, and proceed as with cabbage. It is very liable to intermix with the other Brassicas; so that it is best to depend upon foreign seed. Seed will keep three or four years.

Use.—The heads or flowers boiled, generally wrapped in a clean linen cloth, are served up as a most delicate

dish. "Of all the flowers in the garden," says Dr. Johnson, "give me the cauliflower." It is one of the very best of vegetable products, and so prized wherever known. It is nutritious and wholesome even for invalids, beside being a very ornamental addition to the table.

To Cook.—Cut off the green leaves, and look carefully that there are no caterpillars about the stalk; soak an hour in cold water, with a handful of salt in it; then boil them in milk and water, and take care to skim the saucepan, that not the least foulness may fall on the flower. It must be served up very white, with sauce, gravy, or melted butter.—*Mrs. Hale.*

MARKETING.—The cauliflowers are cut with two leaves left on each to fold over the tender heads to prevent bruising in shipping. Each head is wrapped in paper and carefully packed in bushel crates, with a sheet of brown paper between each layer. Thorough ventilation must be had in the package or spoiling will result before the market is reached.

CELERY.—*(Apium graveolens.)*

Celery is a hardy, biennial, Umbelliferous plant, a native of Britain, where the wild variety, called Smallage—a coarse, rank weed with an unpleasant smell and taste—is found growing in low, marshy grounds, and by the sides of ditches.

There are several varieties, some of which have hollow stalks. None but those which are solid are worthy of notice. Among the best are:

WHITE PLUME.—An early form which has self-bleaching properties. It was first introduced in 1884, and has become quite a popular variety among some gardeners. It can be bleached without high banking. The objection made against this form is its poor keeping qualities. It

should not, therefore, be planted for a late winter crop. The plant is often of strong flavor, which is objectionable.

GOLDEN SELF-BLANCHING.—This also requires comparatively little banking, and produces crisp, large and solid plants of fine flavor. Very few plants are better adapted to garden culture. The flavor is excellent, of a rich, nutty cast. Well adapted for the "New Celery Culture" method.

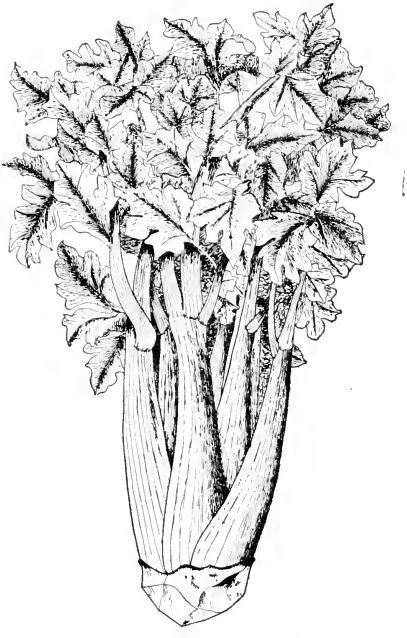
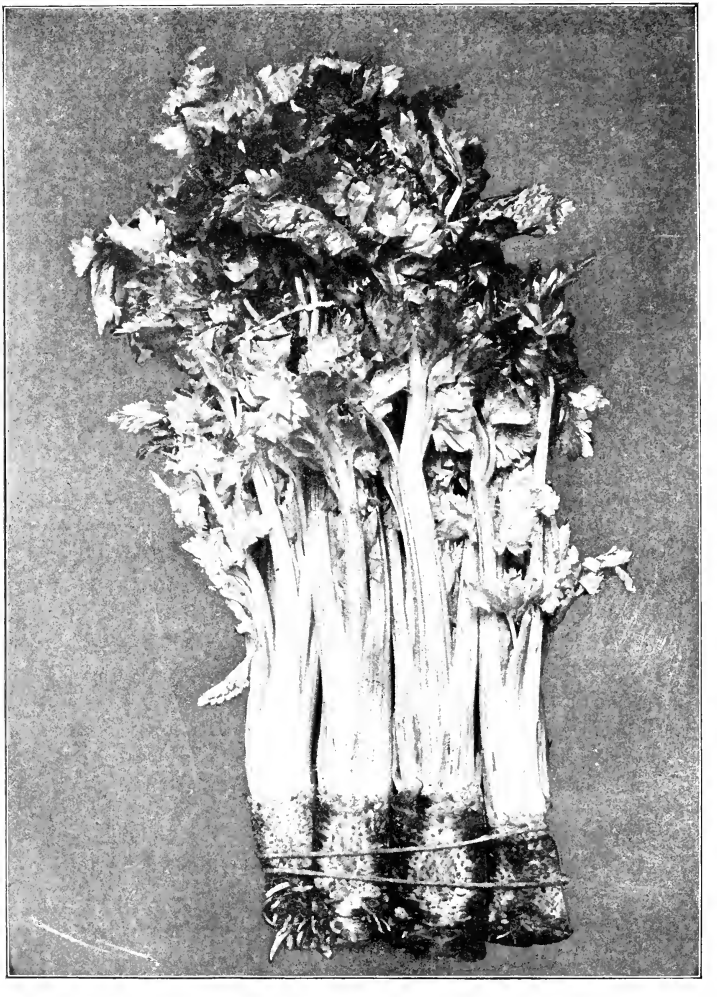


Fig. 114—Giant Paschal Celery.

GOLDEN HEART. In 1886 this was one of the most popular varieties, and it is still holding a strong position with gardeners. An excellent winter keeper.

GIANT PASCHAL. This is of French origin and is large, silver white, and very productive. It blanches quite readily, and retains its freshness a long time. The stalks are large, solid and fine flavored. The Giant Paschal is a selection from the Golden Self-Blanching; has the qualities of the latter, but is a better keeper and is larger.



(312) Plate 3—Golden Self-Blanching Celery.

GIANT WHITE SOLID.—This celery attains a height of three feet, and is well suited to the South, since it grows moderately well in a warm climate.

SANDRINGHAM OR INCOMPARABLE.—Is an old variety of fine qualities. It has been cultivated for over thirty years.

Culture.—The soil for fine celery must be rich in potash, lime, phosphoric acid and chloride of potassium. But it will not do to depend upon special manures alone, without the addition to the soil of well-rotted animal manures.

Celery flourishes best in a soil moist, friable, and rather inclining to lightness. It likes a cool, moist, but not wet soil. There are several modes of cultivation. The common mode is to sow the seed in April thinly in drills eight inches apart. As celery is a long while vegetating in the open air, it is desirable to sow the early crop under glass. Let the seed-bed be very rich, and if not sufficiently moist, sprinkle the drills well before covering, and cover thinly with light, sifted soil. Shade the bed on sunny days, and admit mild rains and warm dews, and keep all close in cool weather until the young plants make their appearance. Unless managed as directed for fine flower seeds, celery will not readily come up. Water must be given from a fine rosed pot if the soil is dry.

The old way is to plant in trenches, a foot deep, well manured at the bottom, and to earth up gradually, as the plants make their growth. This plan is now abandoned by our best growers, and instead the method given by the well-known authority, Mr. Peter Henderson, in his valuable work called "Gardening for Profit," is adopted by many gardeners. There is also another method called the "New Celery Culture," which will be described further on.

Celery may be planted any time from the middle of June to the middle of August; but the time we most

prefer is during July, as there is but little gained by attempting it early. In fact I have often seen plants raised in hot-beds and planted out in June, far surpassed both in size and quality by those raised in the open ground and planted a month later. As I have already said, it requires a cool, moist atmosphere, and it is nonsense to attempt to grow it early in our hot and dry climate; and even when grown, it is not a vegetable that is ever very palatable until cool weather. This experience well proves, for although a few bunches are exposed for sale in August and September, there is not one root sold then for a thousand that are sold in October and November. Celery is often grown as a "second crop"—that is, it follows after the spring crop of beets, onions, cabbage, cauliflower, or peas, which are cleared off and marketed, at latest, by the middle of July; the ground is then thoroughly plowed and harrowed. No additional manure is used, as enough remains in the ground from the heavy coat it has received in the spring, to carry through the crop of celery. After the ground has been nicely prepared, lines are struck out on the level surface, three feet apart, and the plants set six inches apart in the rows. If the weather is dry at the time of planting, great care should be taken that the roots are properly "firmed." Our custom is, to turn back on the row, and press by the side of each plant gently with the foot. This compacts the soil and partially excludes the air from the root until new rootlets are formed, which will usually be in forty-eight hours, after which all danger is over. This practice of pressing the soil closely around the roots is essential in planting of all kinds, and millions of plants are annually destroyed by its omission. After the planting of the celery is completed, nothing further is to be done for six or seven weeks, except running through between the rows

with the cultivator or hoe, and freeing the plants of weeds until they get strong enough to crowd them down. This will bring us to about the middle of August, by which time we usually have that moist and cool atmosphere essential to the growth of celery. Then we begin the "earthing up," necessary for blanching or whitening that which is wanted for use during the months of September, October, and November. The first operation is that of "handling," as we term it—that is, after the soil has been drawn up against the plant with the hoe, it is further drawn close around each plant by the hand, firm enough to keep the leaves in an upright position and prevent them from spreading. This will leave them as shown in Figure 116.

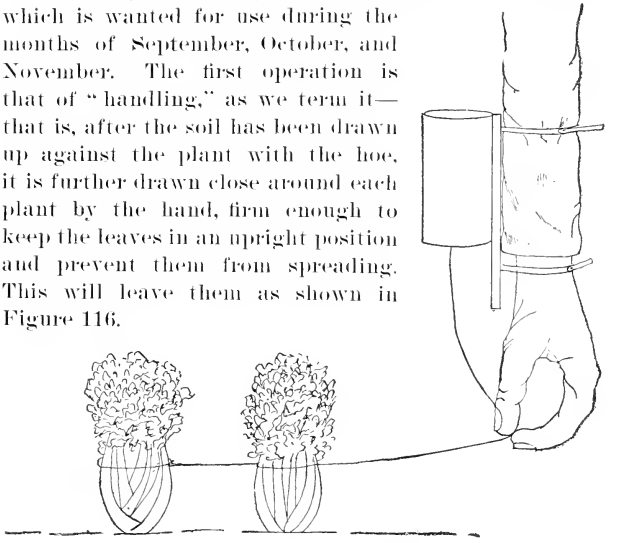


Fig. 115—Tying Up Celery.

E. C. Green, of the Ohio Station, proposes the use of paper string to wind around the plants before banking up with earth, and the string is left on the plants since the moisture will soon so dampen it as to cause it to fall off as the celery grows. The great advantage in the use of string, as shown in Figure 115, consists in the fact that the earth is not allowed to enter the center of the plants while banking up, and thus injure the quality of the

celery. The figure is self-explanatory. A tin can is tied to the wrist in which the cord of string is placed, and the end is fed through a hole in the bottom of the can. Care must be exercised not to bruise the plants while tying up, otherwise disease will set in and the crop will be ruined.

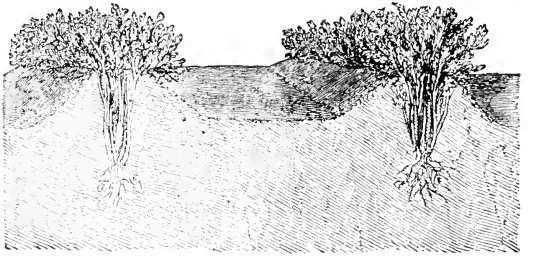


Fig. 116—Celery After "Handling."

The plants being placed in an upright position, more soil is drawn against the row (either by the plow or hoe, as circumstances require), so as to keep the plant in this position. The blanching process must, however, be

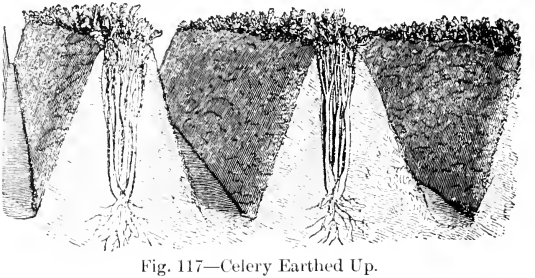


Fig. 117—Celery Earthed Up.

finished by the spade, which is done by digging the soil from between the rows and banking it up clear to the top on each side of the row of celery, as in Figure 117. Three feet is ample distance between the dwarf varieties, but

when large sorts are used the width between the rows must be at least four and a half or five feet, which entails much more labor and loss of ground. For the past eight years I have grown none but the dwarf varieties, and have saved, in consequence, at least one-half in labor, and one-third in ground, while the average price per root in market has been always equal and occasionally higher than for the tall growing sorts.

Some authorities recommend the use of 12-inch plank in bleaching celery, one placed on each side of the row, leaning against pegs, and with a few inches of earth thrown up against the plank to hold it in position. It is claimed that with this method enough of the light is excluded from the stems of the plants to cause them to bleach.

The preparation of the soil and planting of celery for *winter use* is the same in all respects, except that, what is intended for winter need never be "banked up" with the spade. It merely requires to be put through the handling process, to put it in a compact and upright position preparatory to being stowed away in winter quarters. This should not be done before the middle of September, or just long enough before the celery is dug up, to keep it in the upright position.

We have, however, another method called the "new celery culture,"* which we have found to answer very well for the late crop, and it is one by which more roots can be grown on the same space and with less labor than by any other. The best results will be secured by cultivating a self-bleaching variety, like the Golden Self-

* It is of interest to note that in 1892 some writers on horticulture published an account of this method, and claimed the honor of the discovery, calling it the "new celery culture," when, as a matter of fact, this method was in use in 1868, at the time the second edition of this book was issued.

Bleaching. It is simply to plant the celery one foot apart, *each way*, nothing farther being required after planting, except twice or thrice hoeing, to clear the crop of weeds until it grows enough to cover the ground. No handling or earthing up is required by this method, for, as the plants struggle for light, they naturally assume an upright position, the leaves all assuming the perpendicular instead of the horizontal, which is the condition essential before being put in winter quarters. This method is not quite so general with us as planting in rows, and it is perhaps better adapted for private gardens than for mar-

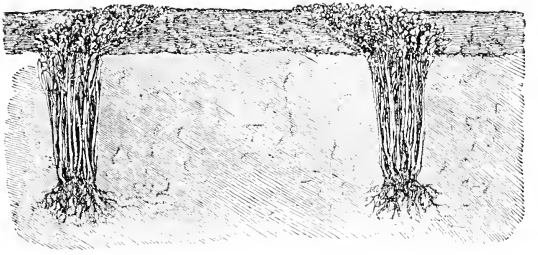


Fig. 118—Old Method of Growing Celery in Trenches. (This is also used for winter storage.)

ket; as the plant is more excluded from the air, the root hardly attains as much thickness as by the other plan.

The manner of preserving it during the winter is very simple, but as the knowledge of the process may not be well understood generally by market gardeners, I will endeavor to put it plain enough, so that my readers "may go and do likewise." In this locality we begin to dig up that which we intend for winter use about the end of October, and continue the work (always on dry days) until the 20th or 25th of November, which is as late as we dare risk it out for fear of frost. Let it be understood that celery will stand quite a sharp frost—say 10 or even 15°, while 20 or 25° will

destroy it. Hence experience has taught us, that the sharp frosts that we usually have during the early part of November, rarely hurt it, though often causing it to droop flat on the ground, until thawed out by the sun. It must, however, never be touched when in the frozen state, or it is almost certain to decay. The ground in which it is placed for winter use should be as dry as possible, or if not dry, so arranged that no water will remain in the trench. The trench should be dug as narrow as possible, not more than ten or twelve inches wide, and of the depth exactly of the height of the celery—that is, if the plant of the celery be two feet in length, the depth of the drain or trench should be two feet also. The celery is now placed in the trench as near perpendicular as possible, so as to fill it up entirely, its green tops being on a level with the top of the trench. Figure 118 represents a section across a trench filled with celery in the manner just described. No earth whatever is put to the roots other than what may adhere to them after being dug up. It being closely packed together, there is moisture enough always at the bottom of the trench to keep this plant at the cool season of the year from wilting. That which is put in trenches about the 25th of October is usually ready to be taken up for use about the first of December, that which is put in a couple of weeks later, by the first of January, and the last (which we try always to defer to 15th or 20th November) may be used during the winter and until the first of April. For the first lot, no covering is required, but that for use during the winter months must be gradually covered up, from the middle of December, on until the first of January, when it will require at least a foot of covering of some light, dry material—hay, straw, or leaves—the latter perhaps the best. I have said the covering up should be gradual. This is very important, for if the full weight of covering is put on at once, it prevents the passing off

of the heat generated by the closely packed mass of celery, and in consequence it to some extent "heats," and decay takes place. Covered up in this manner, it can be got out with ease, during the coldest weather in winter, and with perfect safety. These dates of operations, like all others named throughout, are for this latitude; the cultivator must use his judgment carefully in this matter to suit the section in which he is located.

To Save Seed.—Leave some plants where grown; in the latter part of February take them carefully, cut off the outside leaves, and remove the side shoots, and plant them out in moist soil, one foot apart. Select those which are solid and of middling size. Tie the seed-stalks to stakes, to preserve them from being broken off by violent winds. After the flowers open, while the seed is swelling, if dry weather occurs, water at least every other night. When the seed is dry, it may be rubbed out and stored in a dry place. They will keep good four years.

Use.—Celery has some little nutriment, but is cultivated chiefly as a luxury. The sweet, crisp stalks, used raw, with a little salt, form a most grateful salad. It is also used as a seasoning, and is a great improvement to soups and gravies. A few plants for this purpose are as necessary and wholesome as onions. The unblanched leaves and seeds are sometimes employed in flavoring.

MARKETING.—The celery must be placed on the market in a crisp and clean condition, free from all "stringiness," if good prices are desired. There seems to be no reason why this excellent vegetable should not be so successfully cultivated in the South as to compete with that grown at Kalamazoo. Soil, climate and other conditions are certainly favorable, and there is the additional advantage over the Northern grower in the earliness of the Southern crop, thus permitting the truckers in the South to place their crop on the market several days ahead of those in

the North. There is also a rapidly growing demand all over the South for this vegetable, and the home consumption, therefore, is not to be belittled.

When the plants are taken from the field they are washed to rid them of all particles of earth, and the dead, discolored and green leaves are pulled off, the root is cut off close to the stalks, if intended for the local market. If the celery is to be shipped some distance the roots are left on and packed in a moist condition, so that the plants will be crisp and fresh when they reach their destination. It is advisable to dip the plants in water before packing to insure this condition. For the wholesale trade it is customary in some sections to tie the plants in bundles—twelve plants to the bundle. The shipping is done in crates, or barrels well ventilated.

CELERIAC.—*(Apium graveolens, var. rapaceum.)*

Celeriac, or Turnip-rooted Celery, is a variety of celery which forms at the base of its stem an irregular knob, which is the part used, either cooked or raw, in salads. The roots have been grown to three or four pounds weight. It is sweeter, but not so delicate as common celery, and is not much in use, except in climates so cold that the common sort cannot be easily preserved through the winter, while this can be stored like turnips.

The young plants of celeriac are raised exactly like those of celery. When six inches high they are fit for final transplanting. Set them in rows two feet asunder, and eight inches apart in the rows upon the level ground, or in drills drawn with the hoe three inches deep, as they require but little earthing up. When arrived to nearly their full size, they must be covered over with earth to the depth of four inches. In dry weather they should be watered plentifully every evening, as they like even more water than celery. The only additional attention re-

quired is to keep them free from weeds. The plant is more easily cultivated than celery.

Saving Seeds.—The directions for celery are in every respect applicable to celeriac.

Use.—The stalks are used for seasoning soups, etc., the same as celery, from which they can hardly be distinguished. The roots are nice boiled tender, cut in slices and dressed like turnips. They are often made into a salad, after boiling them, and are used in seasoning soups or meat pies.

Fig. 119—Celeriac.

CHIVES or CIVES.

(Allium Schœnoprasum.)

A hardy, perennial plant of the onion tribe, growing wild in the meadows of Britain, as some varieties of the same genus do in this country. The bunches are made up of a mass of little bulbs, and produce pretty purplish flowers early in summer.

Culture.—Any common soil will answer. Divide the roots in autumn or spring, and plant them on a bed or border, in little bunches of ten or twelve offsets, in holes made with the dibble ten inches apart. If kept free from weeds, they will speedily make large bunches, a few of

which will supply a large family. Cut the tops smoothly off near the surface, when wanted, and fresh ones will soon spring up. Chives make a very pretty edging for beds in winter and spring. Renew every four years by taking up and dividing the roots.

Use.—It is an excellent substitute for young onions in winter and spring salading, and is also used like leeks and onions in seasoning soups, gravies, etc. The leaves, cut up fine and mixed with meal and water, are often fed to young chickens as a preventive of disease. The little bulbs may be taken up and stored, and are a tolerable substitute for small onions.

CORN, SWEET OR SUGAR.—*(Zea maize, var. saccharata.)*

Indian corn, or maize, is a native plant, found distributed in all the milder climates of America at its discovery. There are six varieties or classes recognized as belonging to the genus Zea, viz.: Sweet corn (*saccharata*), Flint corn (*indurata*), Pop (*everta*), Dent corn (*indentata*), Soft corn (*amylacea*), Husk corn (*raginata*).

The cultivation of the sweet corn is not common in the South, for the reason that it is difficult to secure satisfactory crops with seeds obtained from the Northern seedmen. The boll-worm is also found to be very destructive to sweet corn, more so than it is with the field varieties of corn. If, however, seeds are carefully selected from the crops of two or three years' successive growths much more satisfactory results may be expected, from the fact that the plant becomes acclimated by this series of cultivation and selection. The best garden varieties of sweet corn are as follows:

CROSBY'S EXTRA EARLY.—The ears are rather small, but this is a productive variety; rich, sugary flavor; a dwarf form requiring a rich soil. This is one of the old standard varieties.

STOWELL'S EVERGREEN.—A general favorite among market gardeners because of its excellent qualities, adapted to home use and for shipping. The ears are large and remain longer in a green condition than is the case with most of the other varieties. The grains are large, but tender and sweet.

COUNTRY GENTLEMAN.—The cob is small and yields a deep grain of delightful flavor and sweetness. Three or four ears are generally produced on each stalk, and a well-matured ear is about eight inches long. This variety of corn closely resembles the Shoe Peg, introduced by Johnson & Stokes some years since, but it is larger than the Shoe Peg.

Very early varieties are: Adams' Extra Early and Marblehead.

Medium early varieties are: Nonesuch, Roslyn Hybrid, Triumph, Egyptian.

The common Dent corn of the South better endures intense summer heat, and will supply green corn for the table when the preceding sorts fail from drought. It is less injured by the corn-worm, which cuts into the end of the ear, than Sweet or Sugar corn.

Maize likes a soil abounding in soluble silica. Gypsum and ashes are the best special manures. Sweet corn has much less starch than the other varieties, but much more sugar and extract. It has also a greater portion of dextrine and gum.

Culture.—In the Northern States, a dry soil and a hot season are required to produce large crops of corn. At the South we raise far better crops in moist seasons, and on moist bottom lands. Rich, deep loam affords the plant plenty of moisture and nourishment, which the corn likes. The Extra Early and Sugar corn will bear thick planting. Plant the first crop in the open air when the peach is well in bloom, and every three weeks thereafter until July at

New York, and until August in Georgia, selecting the early sorts for the first and last plantings.

The early crop may be forwarded a month, by planting

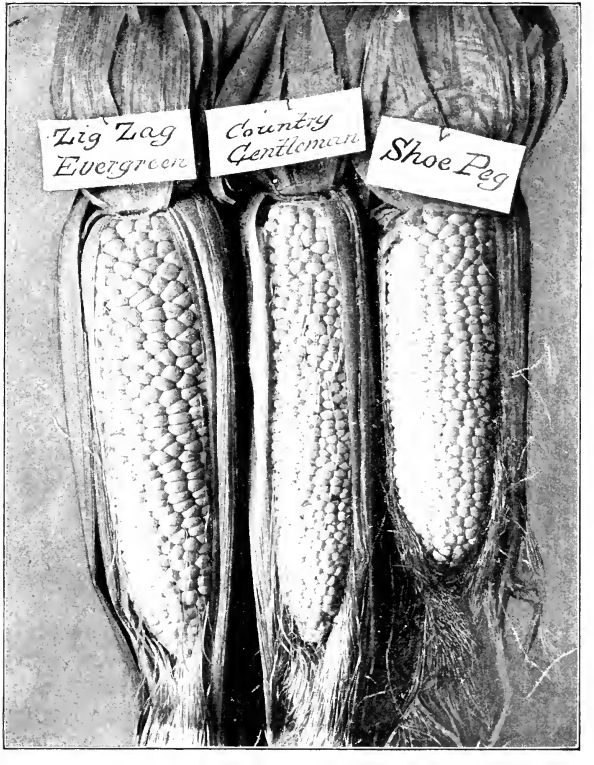


Fig. 120—Sweet Corn.

in boxes (or in pots under glass if only a few plants are desired). "Prepare boxes about four feet long, three feet

wide, and five inches high. Make one of the sides so that it can be easily removed. Fill these boxes with loam mixed with some manure. Then prepare some strips of board two and one-third inches wide, five inches long, and as thin as the blade of a hoe. Put these down endwise into the loam, so as to divide the loam into squares two and one-half inches square and five inches deep. (As these squares are each to contain a hill of corn, it will be seen that the thin strips are to prevent the roots of one hill from interfering with those of another.) Place these boxes in a sunny place, well protected from the west wind, and about a month before the usual planting time, plant four kernels of corn in each one of these squares. By planting time, the corn will be five or six inches high. Having prepared the ground and opened the hills, take the hills of corn from the boxes in the hand, put them into the prepared hill, press the earth around them, and the corn is at once planted and hoed the first time. It would be well to use some phosphate of lime or hen manure, so as to cause the corn to start immediately. In a short time the corn will be as large as usual when hoed the second time." (*New England Farmer.*)

Another and probably simpler method is in the use of what is known among gardeners as "dirt bands." These are thin veneers cut so as to fold up into 4 or 6-inch squares.

The ground for corn should be deeply plowed or spaded, then laid off in hills three feet apart each way, for Sugar and Early corn, leaving three or four plants in a hill, while two plants in hills five feet apart is near enough for large Southern corn. If the ground is not rich, place a shovelful of decayed manure to each hill. Fresh dung can be immediately applied to corn, if spaded before plowing, and well turned in. Plant four or five grains to a hill, and cover two inches deep. When they are up, thin

as above. Hoe deeply and often while young, and draw the earth each time a little about the stalk; but after the plant is six inches high, shallow surface culture, killing the weeds and loosening the surface without cutting the main roots, is all that is needed.

Corn is a gross feeder, and cannot get too much manure. A sprinkling of guano about the hill is beneficial, if it does not touch the seed. Growth is much improved by giving the plants, at their first hoeing, a teaspoonful of gypsum to each hill, or a pint of ashes, or as much of the charcoal *poudrette*. Chickens, birds, and squirrels can be prevented from pulling up the corn by soaking it in water twelve hours before planting, then stirring the seed briskly in a vessel containing a little tar mixed with warm water; thus giving each grain a thin coat. After which, for convenient handling, it is to be rolled in as much ashes, gypsum, or lime as it will take up. One-half bushel of corn requires a pint of tar and a gallon of warm water, with as much ashes as will stick to the grain. It is effectual against birds, squirrels, etc., while the seed vegetates freely, if previously soaked.

For Seeds.—Select the best ears from stalks that bear more than one.

Use.—Indian corn is prepared in a greater variety of ways for the table than any other grain. In fact, the modes of preparation alone would almost fill a volume. That from the garden is mostly boiled green. Green corn can be very easily preserved for winter use, by cutting off the kernels after boiling, and drying in a shaded, airy place. Or, cut the corn off the cob, and put it in a stone jar, with a handful of salt to a pint of corn. When the jar is full, put a weight on it. When you wish to use it, remove a little of the top, and wash and soak it over night. Sugar corn is the best for this purpose.

CORN SALAD.—*(Valerianella olitoria.)*

Corn Salad, Fetticus, or Lamb's Lettuce, is a small annual plant, a native of English wheat-fields. It has long, narrow leaves of a pale glaucous hue, and very small, pale-blue flowers. It has long been cultivated in English gardens as a winter and spring salad. There is also a round-leaved variety, with leaves thicker, and of a darker green.

Culture.—Corn salad likes a loam of moderate fertility, not too heavy. It is raised from seed, one quarter of an ounce of which will sow a bed four feet by fifteen. Sow seed of the preceding year's growth, at intervals from August until frost, in drills six inches apart. Thin the plants as wanted for consumption to four inches in the drills, and keep free from weeds by frequent hoeing. Gather the leaves to eat while young, taking the outer ones, as with spinach. It will be fit for use all winter, where the ground keeps open. A spring sowing may be made among the earliest crops, put in for later use when desired. Allow some of the plants to shoot up to seed, which, as they shed easily, is shaken out upon a cloth spread under the plants. It keeps six years.

Use.—It is used during winter and early spring to increase the variety of small salads, and as a substitute for lettuce. In France it is boiled like spinach.

COWPEA.—*(Vigna Catjang.)*

Several species are largely cultivated in most Southern climates, the vines of which are used for forage, and the seeds employed not only for stock feeding, but the finer kinds are used largely as substitutes for kidney beans as food for man.

The cowpea is generally considered to be a field crop, and it would seem to have no place in a treatise of the

character of this book, but its value in restoring fertility to soils is so great that gardeners will find it a useful plant. It occupies a prominent position as a soil restorer from the fact that it has the property of drawing a large per cent. of nitrogen from the atmosphere and giving it to the soil when the plants are turned under. The best varieties to use for green manuring are Black, Clay, Red Ripper, Unknown. Some of the varieties of cowpeas are also excellent for table use, viz.: Large lady, Small lady, Mush, Rice, Sugar and White Crowder.

CRESS, AMERICAN.—*(Barbarea vulgaris.)*

A biennial Cruciferous plant with yellow flowers, the radical leaves of which are lyre-shaped, and the upper ones pinnatifid, and cultivated in some gardens as a winter salad. Often called water-cress at the South.

Sow either in drills or broadcast in a moist place, the last of August, September, or early in October, giving water in dry, hot weather. Let the plants remain six or eight inches apart. Preserve a few good plants for seed.

Use.—It is generally liked as a winter or early spring salad, somewhat like the water-cress, but more bitter.

The Winter Cress (*B. præcox*) resembles the foregoing, but is a perennial plant with larger leaves. The use and culture are the same. Less bitter than the former.

CRESS, GARDEN.—*(Lepidium sativum.)*

Cress, or Peppergrass as it is called, from its pungent taste, is a hardy Cruciferous annual, probably from Persia, and has been cultivated in England since 1548.

There are three sorts, of which the common Curled and the Normandy are the best; the broad-leaved sort is coarse and inferior.

Culture.—Cress likes a light, moist mould, and in summer a shady border is to be preferred. It is propagated

from seed, which, to keep up a succession of young and tender plants, must be sown every week or two. Give it rich earth, that it may grow rapidly. It is best when an inch high, but is generally allowed to get two or three times as high before cropping. Begin to sow for winter and early spring use in September and October, in a sheltered situation; and again as soon as spring opens, sow in the open ground, in drills six or eight inches apart; cover lightly, and pat over the bed with the back of the spade to press the earth upon the seed. Keep the ground clear, and water in dry weather. It can be had all winter by the use of the cold frame or hot-bed; give plenty of air. A few rows left uncut will produce seed abundantly.

Use.—The young and tender leaves give to salads a warm, pungent, and agreeable taste. It is generally used in connection with lettuce and other salads.

CUCUMBER.—(*Cucumis sativus.*)

This is a tender, trailing annual, with rough, heart-shaped leaves, and yellow flowers, growing wild in the East Indies, etc. It is one of the earliest garden products mentioned in history, and was cultivated from the earliest times in Egypt. (*Numbers*, xi., 5.)

It has always been a vegetable peculiarly grateful and refreshing to the inhabitants of warm climates. It was probably early brought into Europe from the East, as it was in high esteem among the Romans, who so well understood its culture, that it appeared on the tables of the wealthy in winter. In England, it was introduced as early as 1573. The best varieties are:

EARLY CLUSTER, named from the fruit growing in clusters. The fruit is about five inches long, very productive. Early Russian is a smaller and earlier variety of this.

EARLY FRAME.—Six to ten inches long, much used for forcing; productive and good.

IMPROVED EARLY WHITE SPINED.—Is of fine form, deep green color, which it retains well; a good bearer, and of the best quality.

LONG GREEN.—Dark-green color; grows about ten inches in length and bears abundantly; excellent for pickles; late.

THORBURN'S EVERBEARING is an excellent cucumber.

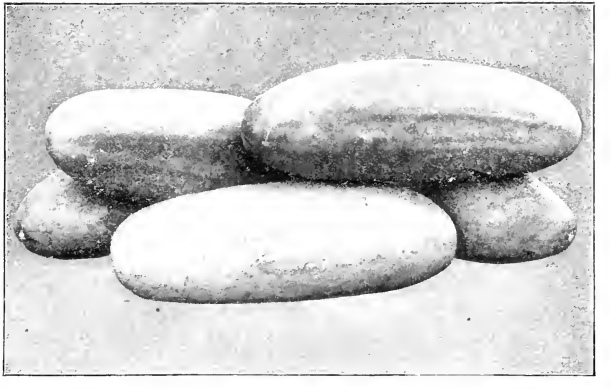


Fig. 121—Arlington White Spine Cucumber.

GHERKIN (*C. Anguria*).—A different species with small and prickly fruit, and leaves much divided, or palmated; a great bearer, but used only for pickling.

There are many other varieties, some of which grow two feet long, crisp and well flavored, but the foregoing are the best for family use.

For market use the Boston White Spine is generally planted.

Culture.—The seed may be planted here about the first of April, or as soon as it can be done with safety, as this

plant is very tender, and will not bear the least frost. If the soil be deeply trenched, the plant is much less susceptible to drought. After the ground is prepared, dig out holes fifteen inches deep and the same in diameter, six feet apart each way, and partly fill them with well-decomposed manure. A little guano, or fowl manure, sprinkled in the bottom of the hills will be very beneficial. Do not use fresh manure, or the plants will die out. Cow manure and leaf-mould are excellent. Cover over the manure with rich, mellow loam. Raise the hills a little above the surface, and put eight or ten seeds in the hill; cover an inch deep, and when they get rough leaves, pull up the poorest plants, and leave but three in the hill. Old seed is much better than new, as the plants will run less to vines and bear better.

The Florida Experiment Station recommends the following as an excellent fertilizer:

"Available phosphoric acid,	7 per cent.
Potash,	8 per cent.
Nitrogen,	5 per cent.

"Fifteen hundred or 2,500 pounds per acre will be required on most lands. If the land is rich in organic matter use less or none of the nitrogen. A tablespoonful of nitrate of soda sprinkled about the hills as soon as the plants are up will hurry them along out of danger from insects. Too much nitrogeneous matter makes poor shippers and overgrown sizes."

As soon as the vines get rough leaves, nip off the extremities, to make them branch out, and they will fruit the sooner. This is called *stopping*. Cucumbers are very subject in cool, dry seasons to attacks of insects, especially the striped bug and the cucumber flea. Dry wood ashes or air-slacked lime, dusted thoroughly upon the plants when the dew is on, will generally repel them, and bring the plants forward. But warm rains will soon

bring up the plants beyond the reach of the depredators. If they do not, put over the hills boxes covered with millinet. Hoe frequently, until the plants cover the ground. The Early Cluster should have the hills about four feet apart.

After the first planting succession crops for pickles are put in up to July near New York city, and in Georgia until August. At the South the melon worm makes its appearance in July, and unless the cucumbers are gathered while small, they will be injured by this insect.

Cucumbers can be very much forwarded by planting them in boxes covered over with glass. Two seven-by-nine panes are large enough to cover a hill, and such hills will not be troubled by the bugs, while the seed can be put in four or five weeks earlier than otherwise. The seed can also be planted in pots under a frame, or in a greenhouse, to be turned out, when the weather gets favorable, into the open air, and they will scarcely show they have been moved. Or they can be raised wholly without removal, in hot-beds made as directed in a former chapter. They do best when started in pots placed in a small hot-bed, and transplanted when the leaves are two or three inches broad into new beds of a larger size. They must have plenty of air, and be placed near the glass, or they will be drawn up. If they begin to grow long-legged, give them more air. The temperature of the seed-bed should range between 65° and 85°. Always water the plants with tepid water, about noon, unless in mild days, when it may be done in the morning.

Liquid manure, especially guano water, is very beneficial. In planting in the bed for fruiting, do not break the ball of earth; take them out of the pots carefully at night, water gently, keep the sash down the next day, and shade at noonday, to keep them from withering. It is necessary the beds should be shaded with a mat during

the middle of the day, when the sashes are kept down, until the plants get well established.

Stopping in the frame is still more important than in the open air. The temperature now must be kept between 70 and 90 , by external coatings of fresh dung, if necessary. The shoots must be trained regularly over the surface of the bed. Leave only two or three main branches to each plant, removing the others as they appear. If the plants that have been stopped have extended their runners three joints without showing fruit, they must be stopped again. The vines should blossom in a month from the time of planting. Impregnate the pistillate or female blossom (which may be known by its having fruit attached), by taking the staminate blossom and placing its center within that of the pistillate blossom. They may be gathered in about two weeks after impregnation. Three plants are sufficient for one sash of the usual size.

For Seed.—Choose some of the finest fruit of each variety growing near the root. Do not raise the plants near other varieties, or the seed will mix and deteriorate. Let them remain until they turn yellow, and the footstalk withers; cut them off and keep in the sun until they begin to decay; then wash the seed from the pulp, and spread it out to dry. It will keep eight or ten years, and is even better when three or four years old, as the plants are less luxuriant and more productive.

Use.—Cucumbers are a very popular, but not very wholesome vegetable. They are of a cold, watery nature, and many persons of weak constitution cannot eat them without positive injury. They possess scarcely any nutritive properties, but their cooling nature renders them to most palates very agreeable, and persons in good health do not find them injurious. They are eaten raw, fried, stewed, and pickled.

MARKETING.—The well-grown cucumbers should be

selected for shipment to market. They should be green through in cross section, and should be of such a size that ninety will just fill a bushel crate; the form must be full and not badly shaped. No cucumber of a yellow tint must be placed in the package if a good price is expected.

The ordinary vegetable crate is used for shipping this vegetable to the market. The cucumbers are laid in close and compact, and the crate filled above the top; then the top is pressed on, so that the vegetable is securely packed, and no movement becomes possible during shipment.

CHINESE YAM.—(*Dioscorea Batatas.*)

A perennial plant brought from China to France in 1850 or 1851 by M. de Montigny, the French Consul at Shanghai. It has annual stalks or vines, and perennial tuberous roots. The leaves are heart-shaped, triangular, pointed above, and seven or eight nerved. The length and breadth of the leaf are about equal; it has a smooth and glossy surface, and is of a deep green color. Its footstalks are half the length of the leaf, furrowed, and of a violet color. Its flowers are dioecious, and of a pale yellow color. The twining stems turn from left to right, and grow, if staked, at least ten or twelve feet high, and develop from the axils of the leaves small tubers, the size of a large pea or kidney bean, which drop from the stem at maturity.

Culture.—The small, axillary tubers afford the readiest mode of propagating the plant, though the largest product seems to have been obtained where the root tubers were cut in sections an inch or an inch and a half long. These should be planted in rich ground deeply trenched, the deeper the better, and then laid off in low ridges or beds eighteen or twenty inches from center to center. On the top of this ridge a furrow, three inches deep, is made

with the hoe, in which the sets are planted. This should be done early in the spring, and where the seasons are short the plants should be started in pots to be planted out when danger of frost is over. Keep the young plants free from weeds, and cultivate like sweet potatoes, except that no earthing up is required. The plant likes moisture, and growth is arrested in dry weather. It is found to produce larger roots if not staked, and the plant is allowed to fall upon, and shade, the ground. Watering in dry weather is beneficial. The crop should not be gathered until after the autumn frosts, and roots will be found somewhere between ten and thirty-six inches below the surface. The whole root should be extracted, as the lower part is always the largest and most starchy. This should be reserved for the table, while the upper or slender part should be kept for propagation. It is a difficult matter to take them up without breaking, as they often grow three feet long. If not required for immediate use, the roots may safely remain in the ground until spring, or may be taken up and stored. The deep trenching required in preparing the soil, and the great labor in gathering the crop, will prevent its extensive cultivation.

Use.—The roots, which are oblong and tapering, are the edible part. The maximum size to which they grow is two inches in diameter, the larger end tapering upward to the size of the finger. They are covered with a brownish-fawn-colored skin, pierced by numerous rootlets. Under this is a cellular tissue of a white opal color, very crispy, filled with starch and a milky, mucilaginous fluid, with scarcely any woody fiber. When cooked, it boils or bakes quickly, and becomes dry and mealy, and is generally preferred to the Irish potato, which it resembles in taste. Each plant often produces several tubers, but generally only one, ranging in weight from eight ounces to three pounds. It is more nutritive than the Irish

potato, which it may possibly rival in esteem wherever labor is cheap and it is desirable to obtain a large amount of food on a little space.

The other yams (*Dioscorea sativa* and *alata*) are cultivated on the Gulf coast to some extent, and in the same manner as the sweet potato, except that the vines are supported by a stake or pole.

D. aculeata sometimes grows three feet in length, and often weighs thirty pounds. The roots are cut up into small sets and planted in rows two feet apart and eighteen inches in the row, and by forwarding them in pots upon hot-beds have been grown in Europe as far north as Paris.

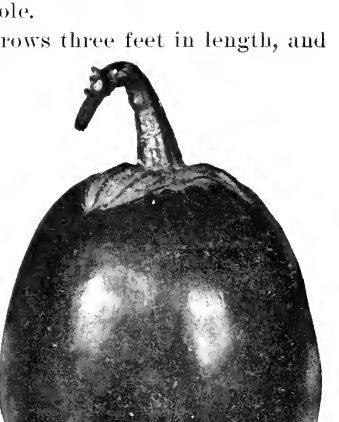


Fig. 122—New Jersey Improved Large Purple Eggplant.

EGGPLANT.

(Solanum melongena, var. esculentum.)

The Eggplant, or Guinea Squash, is a tender annual from Africa, introduced into England in 1597. It derives its most common name from the white variety, which, when small, bears a close resemblance to an egg. When first introduced, it was not regarded with much favor, but is now rapidly working into general esteem.

LONG PURPLE is perhaps the best kind for family use, as it is ten days earlier than the other varieties, and though not growing so large, is very prolific in fruit.

IMPROVED NEW YORK PURPLE.—This is one of the best varieties, and is usually the kind planted. It has a large fruit of an oval shape and deep purple.

BLACK PEKIN.—The fruit is purplish-black, smaller than the preceding; solid, smooth. It is prolific and fine flavored.

Culture.—Eggplants require a light, loamy, rich soil, to bring their fruit early to perfection. They like the soil manured with half-decayed leaves, well dug in. To have them early, sow in a hot-bed, or in a cold frame under glass, the latter part of February, or early in March. The rows may be six or eight inches apart, made shallow and the earth pressed upon the seed. Keep the sash carefully closed until the plants are up, and then give air in warm days. They succeed best with a small frame to themselves, as they like a higher heat than is desirable for other plants. As very few plants are required, they may be planted in a small box without bottom, placed on the ordinary hot-bed and covered with a square of glass. Prick them out, when two inches high, into small pots, and afterwards transfer them to larger ones, as directed for the tomato. They can thus be planted out with the ball of earth entire. Do not put them out until settled warm weather, for if the plants get chilled while young their growth is so checked that they may never fully recover.

The plants, when young, are often destroyed in a day or two by a minute flea. Keep them closely covered until well out of the seed-leaf, and, if attacked, sprinkle them with a solution of aloes or quassia, and dust them with lime and sulphur.

It is hardly worth while to sow the seed in the open ground, as they would be so late in coming into use. Prepare the final bed for eggplants by making trenches three feet apart, burying in them old cabbage stumps,

corn stalks, and other vegetable refuse, and covering them with soil twelve inches deep, in which plant out the eggplants two feet apart in the row. Water abundantly until established. Keep the ground well hoed and free from weeds, and earth up the plants a little from time to time. Twelve to twenty plants will be enough.

For Seed.—Allow one of the largest fruits from a prolific plant to ripen seed. It will keep three or four years.

Use.—Eggplant is used by the French in various ways in soups and stews, but generally cut in thin slices, and fried in batter. They are not commonly liked at first, but after a few trials become very agreeable to most tastes, and are esteemed a delicacy. They are fit for use when some two or three inches in diameter, and continue so until the seeds begin to change color. They are not unwholesome, but cannot be very nourishing, as they contain a very large proportion of water. Before frying, they should be cut in slices a quarter to a half of an inch thick, and piled on a plate with alternate layers of salt, in order to remove the acrid taste.

MARKETING.—The eggplant to be marketable must be of good average size, weighing not less than one pound, and must have the coloring not too light, and must be tender. The stem is cut to the length of about one inch, and each eggplant is wrapped in paper before packing. Pack in bushel crates firm and solid, so that there will be no movement in the vegetable while shipping; use every care to prevent bruising.

ENDIVE.—*(Cichorium Endivia.)*

Endive is a hardy annual, a native of China and Japan; first cultivated in England in 1548. The root leaves are numerous, large, sinuate, toothed, and smooth. The stem rises about two feet high, producing generally blue flowers. The best varieties are:

LARGE GREEN CURLED.—A fine, hardy variety, with long, beautifully curled leaves. It is the best for salads.

BROAD-LEAVED BATAVIAN has thick, plain, or slightly wrinkled foliage. It is principally used for cooking, and making a larger head is preferred for stews and soups, but is not much used for salads.

Culture.—Endives delight in a light, rich soil, dug deeply to admit its tap-roots, and to serve as a drain for any superfluous moisture in the winter standing crop. The situation should be open and free from the shade of trees.

If desired in summer, sow as early in the spring as possible. The main crop is sown near Philadelphia the first of July; here in August or September for fall and winter use. Sow at this season, if possible, everything just before a shower; draw a furrow the depth of the hoe, in the bottom of which scatter the seed thinly, and cover slightly with earth, pressing it upon the seed. Plant in the evening, if dry, and before covering water copiously with the fine rose of a water-pot in the drill. Do not press the earth upon the seed until morning; shade during the day, and continue watering in the evening until the plants get rooted. The drills should be twelve or fifteen inches apart. Hoe freely and keep the ground free from weeds; thin the plants when two inches high. Those removed may be transplanted to another location; choose moist weather for this purpose; trim the leaves a little, and water moderately every evening until the plants get established, and during very long droughts. Those left in the seed-bed make the best plants. They should be thinned to twelve or fifteen inches in the drill, or planted out that distance apart, the *Batavian* requiring the most space.

In about three months after sowing, as they grow stocky and full in the heart, the leaves being about eight

inches long, tie up the leaves of a few every week or so to blanch, and render them tender and remove their bitter taste. Perform this in dry days. The curled sort will sometimes blanch pretty well if neatly earthed up without being tied, but it is better to tie it. The broad leaved, from its loftier and looser growth, needs a bandage. Fold the leaves round the heart as much as possible in their natural position, and tie them up with a string or shred of bass; then cover them entirely with sand in the form of a cone, making the surface smooth and firm. This must be done in dry, but not frosty weather, as the plants will rot if the leaves are wet or frozen. They may also be blanched under garden pots like sea-kale, or by merely tying them closely, winding the string several times round the plant and closing the top, so as to exclude the rain, drawing the earth around the base to support it. This is the best mode in hot weather; in autumn they will blanch in ten days; in winter they require nearly twice that time. Succory to blanch is taken up and planted in boxes of mould, which are carried into a cellar or dark room and watered when necessary. The blanched leaves will be supplied all winter. Endive needs no protection in our Southern winters. At the North it is taken up with earth about the roots, and wintered in frames.

For Seed.—Let some of the best and most vigorous plants remain till February, and transplant if you wish to use the ground, in rows eighteen inches apart. Support the stems by stakes, and gather the seed vessels as they ripen. Dry them thoroughly on a cloth, thresh, and preserve in paper bags. The seed will keep four years.

Use.—Endive is cultivated for its stocky head of leaves, which, after their bitterness is removed by blanching, are used in autumn and winter for salads and stews. It possesses several of the virtues of the dandelion; it never

disagrees with the stomach, but suits every constitution. The French use it in a variety of forms—raw, stewed, boiled, etc.—but it is chiefly employed as a salad.

GARLIC.—*(Allium sativum.)*

This is a hardy perennial from Sicily and the south of France; it has been cultivated at least three hundred years. There are two sorts—one with large and the other with small bulbs—each bulb consisting of a half dozen or more small bulbs or cloves.

Culture.—Garlic likes a dry, light, rich soil, but not freshly manured; the manure should be put on the preceding crop. Prepare the ground as directed for the rest of the onion tribe, and mark it off into drills eight inches apart. Plant the cloves four inches distant in the drills, and two inches deep, and see that they are put in right side up. Keep the ground free from weeds, and light by frequent hoeing. Plant from October to March.

A few roots may be taken up the latter part of May for use as required, but do not lift the crop until the leaves are withered. Break down the seed stalk if it rises, to prevent it from running to seed, which would lessen the size of the bulbs.

When the leaves turn yellow, take up the bulbs and dry them thoroughly in the shade, tie them together by the tops, and lay them up for winter in a dry loft as you would onions. If the ground is not needed for another crop, they may remain to be drawn as wanted.

Use.—This plant has a well-known, strong penetrating odor, which is most powerful at midday. In medicine it is an excellent diaphoretic and expectorant; a diuretic when taken internally, and has a reputation as an anthelmintic or worm destroyer. Some nations use it very extensively for seasoning soups and stews, and indeed it enters into almost every dish; but in this country it is not

very much liked. Still, a *very slight*, scarcely perceptible flavor, or, as the French have it, a *soupcon* (suspicion) of garlic is not repugnant, but rather agreeable to most tastes.

GROUND PEA.—*(Arachis hypogœa.)*

This plant is likewise known as the Pindar and Pea-nut. Although not exactly belonging to the kitchen garden, a few hills should be allowed a place for the sake of the little folks. It is a trailing, annual, leguminous plant,

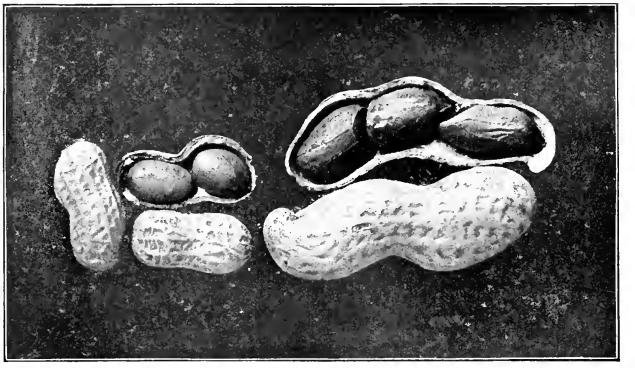


Fig. 123—Spanish Peanut. Improved Georgia Peanut.

a native of South America, from whence it was transported to Africa and our own country. It is one of the few plants which ripen seed under ground. The yellow, pea-shaped flower springs from the part of the stem near the surface of the earth, and after being fertilized, the flower stem elongates, growing from four to eight inches, turning downward until the small tubercle which is to be the future seed-pod reaches and penetrates the earth. The seed of the ground pea abounds in a fine oil, which is sometimes expressed for table purposes. This oil renders

it a very valuable crop for fattening hogs, being for this purpose fully equal to, and probably better than corn. The vines are greedily eaten by most farm animals.

There are several varieties, viz.: Virginia running and bunch, Spanish peanut, Tennessee white and red, Georgia improved peanut, and North Carolina. The peas of the Georgia are larger than those of the Spanish, and they are also superior in quality. The plants are productive and yield few imperfect peas. The Virginia are most popular with the trade.

Culture.—The ground pea thrives and produces best on a light, sandy, tolerably fertile soil, with a good clay subsoil. Like clover, it possesses a long tap-root, which extends deep into the earth, drawing thence the nutriment which is beyond the reach of many of our cultivated crops. The soil should be deep and mellow and well broken up, so as to be ready for planting soon after the heavy frosts are over. The last of March or the first of April is a suitable time. They succeed well as far north as Virginia, beyond which they may be started early in hot beds, and transplanted to the open ground when the weather becomes mild.

For field culture, they may be planted in the pod, two in the hill; but for the garden should be shelled. It is best to drop about four in a hill on the level ground, the rows being laid off three and a half feet wide and the hills two feet asunder; cover them two or three inches.

When they come up, thin them to two in a hill, and, if there be any vacancy, transplant. It is better to plant them level than on ridges, as they are less liable to suffer from drought. As they continue growing all the season, it is well to get them started as soon as the severe frosts are over. The only after-culture they require is to keep the ground clean and mellow, and a slight hilling up when they are laid by. They will produce from twenty-

five to seventy or eighty bushels per acre, according to soil and culture, and are as easily cultivated as corn.

MARKETING.—The harvesting is done by means of a plow, and as fast as the plants are turned over they are shaken by means of a pitchfork to free them from dirt and then they are piled in rows for a few hours until partially dry. Stacks are made in the field by placing the plants on boards (to raise them from the ground so that they will not decay,) around an upright pole, where they remain for several days until entirely dried out, when the nuts are picked from the vines by women and children. This method of harvesting makes the nuts cost more than when gathered by machinery, but it is claimed that the condition of the nuts is better when gathered by hand. The crop is placed in sacks and shipped to the cleaning and sorting factory, where they are cleaned of all grit and imperfect nuts by machinery, and they are then ready for the market. They are sacked and sold by measure.

HORSE-RADISH.—*(Nasturtium Armoracia.)*

Horse-radish is a Cruciferous perennial plant, growing naturally in moist places in England, and various other parts of Europe. Its flowers are white, and appear in panicles in May. It has long been an inhabitant of the garden.

Culture.—Horse-radish delights in a deep, rich mould, moderately and regularly moist; the roots are never of good size if grown in poor soil, or under the shade of trees. It seldom produces seed, and hence is propagated by sets provided by cutting the roots and offsets into lengths of two inches. The tops and crowns of the roots make the best sets, as they are earlier and make a finer growth than those from the centre of the root. Each set should have two eyes. The finest crops are made by trenching

the ground two feet deep, and planting the cuttings with a long, blunt-pointed dibble. It may be done late in the fall, or if in spring, the earlier it is planted, if the ground is suitable, the better. The rows should be eighteen inches apart, the plants twelve inches in the row, and planted eight or ten inches deep. After the beds are planted, smooth the surface and keep clear of weeds, and avoid treading upon the beds, as they should be kept as light as possible. If planted in March, a crop of radishes or lettuce may be taken off the ground before the plants make their appearance. They speedily root and send up long, straight shoots, those appearing in April that were planted in autumn. The only cultivation is to keep them free from weeds, and remove the decayed leaves in autumn. Hoe and rake the bed over in autumn, and also the following spring. By the next fall, the roots are ready to take up as wanted. If the plants throw up suckers, they should be carefully removed as they appear.

If any manure is applied to horse-radish, it must be put at the bottom of the trench before planting, or the plant will send out side shoots in search of the manure, which would greatly injure the crop.

To take them up, a trench is dug along the outside row down to the bottom of the upright roots, which are cut off nearly level with the original planting. The earth from the next row is turned over upon them to the desired depth, and so on until finished. The pieces of roots left will send up new shoots, and the same bed will produce well in this way five or six years, when the site of the plantation should be changed; when this is to be done every piece of root should be taken up, for the smallest of them will vegetate and prove troublesome if left. The best roots come from fresh plantations.

Use.—Horse-radish scraped into shreds with vinegar is a well-known and desirable accompaniment to roast

beef. It is also used in fish and other sauces and chicken salads, and is thought to assist digestion. The shreds pickled in strong vinegar and closely stopped in glass bottles will keep for years.

HOP.—*(Humulus Lupulus.)*

The Hop is a plant of the Hemp or Nettle family, with a perennial root, throwing out many herbaceous climbing stems, and is found growing wild on the banks of rivers in Europe, Siberia, and our own country. It was cultivated in England, in or before 1525, when the old doggerel states:

> "Hops, heresy, pickerel, and beer,
> Were brought into England in one year."

A few roots should be in the garden, as they are useful in making yeast and beer.

Culture.—It is propagated by dividing the roots in autumn and spring. It being dioecious, care should be taken to get sets from the pistillate plants. To produce the crop in perfection, there should be a male plant in the vicinity. Give the plant a deep, rich soil; put two or three plants, six inches apart, in a hill (making with the plants, when set, a triangle), and the hills six or eight feet apart. Keep the ground free from weeds, and well stirred. Manure them every year. Give them poles twelve or fourteen feet long, and two or three poles to each hill. Gather when of a straw color, and the inside of the hop is covered with a plentiful yellow dust, and the seeds are brown; dry thoroughly, and put them up in bags for use.

Use.—The principal use of the hop is in the preparation of yeast, etc. The young shoots and suckers are boiled and eaten as asparagus. It is very largely cultivated in fields, to be used in the manufacture of ale and

strong beer. Its medicinal qualities are tonic and soporific. In gardens it is often grown as a screen, to hide unsightly objects, the plants being set twelve inches asunder in a row, and staked, or trained on a trellis.

KOHL-RABI.—*(Brassica oleracea var. caulo-rapa.)*

This plant, called also Turnip Cabbage, from the turnip-like form of its stem, is but yet little cultivated. The edible part is the enlarged short stem, which is of a globular form, with a few leaves on top. Its culture is the same as the cabbage, except that in hoeing care must be taken not to throw dirt into the heart of the plant, or the bulb cannot form. In hoeing, keep the soil flat.

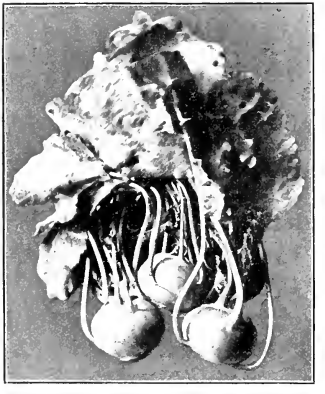


Fig. 124—New Smooth White Short-Leaved Kohl-Rabi.

The Early White Vienna and Early Purple Vienna are the best for the garden. It is cultivated exactly like the rutabaga turnip, for which, when cooked young, it is an excellent substitute. When full grown, it is used for feeding stock. It is very hardy, and needs no winter protection in the more southern States.

LEEK.—*(Allium Porrum.)*

The Leek is a hardy biennial of the onion tribe, found wild in Switzerland, but has been cultivated in gardens from the earliest times. It is mentioned in the Scriptures with the onion as one of the vegetables of the Egyptians;

and at the present day is often associated with the name of St. David, the patron saint of the Welsh. This plant endures the extremes of heat and cold without injury.

Ashes, bones, gypsum, and common salt will supply the requisite inorganic materials for this or almost any other garden crop. A compost of guano, gypsum and charcoal would be very beneficial.

Varieties.—There are two in common use—the Scotch Champion, which is the larger and hardier, and the London Clay, which by many is considered the better of the two—both tall, with thick stems and broad leaves. Large American flag is a large form, hardy and excellent quality, and is a favorite. The Large Rouen Leek, with dark-green leaves and a short stem, sometimes grown to the thickness of a man's arm, is now most liked in France. Its stem is said to grow large enough for use sooner than any other, and it is now much esteemed.

Culture.—The leek is raised solely from seed, which may be sown at any time during autumn, winter, and spring, until the middle of April. February is the best month for the purpose, if but one crop is raised.

The soil for leeks, as for the others of the onion tribe, should be light and rich—the blackest and most fertile soil of the garden—but the manure applied must not be rank. The same guano compost may be applied as for onions. They are generally sown broadcast, but it is a much neater method to sow in drills. Make the drills in the seed-bed eight inches apart, and about an inch deep, and scatter the seed rather thinly. Press fine earth upon the seed, as directed for onions. Some gardeners thin them out, and allow them to remain in the seed-bed, but the leek is so much improved by transplanting that this plan cannot be recommended. When the plants are three or four inches high, they must be weeded and thinned to one or two inches apart, and frequently watered in dry

weather. The seed-bed must be kept clean and light by weeding, or the use of the hoe whenever required, until the plants are six or eight inches high, when they will be fit for transplanting. They must then be taken away from the seed-bed, the ground being previously well watered, if not already soft and yielding.

Having prepared beds four feet wide by spading in a quantity of well-rotted manure, lay it off in little trenches twelve inches apart, and as deep as the hoe will conveniently go. Dibble holes three inches deep, and nine inches apart in the bottom of the trenches, in which set out the plants. Press the earth to the roots and neck only, and not to the leaves. The tops and roots may be slightly trimmed and shortened. Some prefer planting them, as is best for shallow soils, on the level surface of the prepared bed, by inserting them in holes made with the dibble nearly down to the leaves, with the whole neck beneath the surface, that it may be well blanched. Choose a moist time for transplanting, and give a little water should they droop. A portion may remain in the seed-bed six inches apart in the rows, but they do not grow as large as the transplanted ones.

The beds must be hoed occasionally, to keep them free from weeds and loosen the soil. In dry weather they should be freely watered. By cutting off the leaves a little about once a month, the neck will swell to a much larger size; earth them up gradually, if they stand on a level ground, and, if in the trenches, the earth should be drawn by a hoe, little by little, into the trenches, as the plants increase in growth.

If a very early crop is desired, they may be planted in September, and the plants will be ready to set out the middle of February ensuing, and will come into use in June or July. Leeks can be planted between almost any other crop by giving six inches extra room.

For Seed.—Some of the finest roots of last year's growth may be transplanted in February eight inches distant in a row. When the seed stems arise, they must be supported by tying them to stakes. The heads should be cut when changed to a brownish color, with about a foot of the stalk attached, for the convenience of tying them into bundles of three or four to dry. When dry, they may be hung up in a dry place, and kept in the head until wanted, or threshed out and stored in paper bags; the seed will keep two years.

Use.—The whole plant is much used in soups and stews, but the most delicate part is the blanched stems. From its mild, agreeable taste it is esteemed by many above the onion.

MARKETING.—Peel off the outside scales, tie in bundles of six and eight and pack in crates.

LENTIL.—(*Lens. esculenta.*)

The garden Lentil is an annual Leguminous plant cultivated in France for its flat seeds, of which two are contained in each pod. Lentils are planted at the same season with snap beans, in warm, sandy soil. If planted in one too rich, they grow vigorously, but produce few seeds. Sow in drills twenty inches asunder, covering lightly, and manage them like the snap bean. Harvest when the stems begin to turn yellow, and the pods of a dark color, but do not beat them out of the pod until required for use, as in this condition they remain longer fit for use and sowing.

Green or dry they are cooked like beans, and when dry, should be boiled two hours and a half. Soak in water before boiling. When done, add butter, pepper, and salt. They are an excellent addition to soups, being very nutritious. Like beans and peas, but in a greater degree, they are apt to be unwholesome for those of weak digestion.

LETTUCE.—*(Lactuca sativa.)*

Lettuce is a hardy, annual, composite-flowered plant, generally considered a native of Asia. The Cos lettuce, however, came from the Greek island of Cos, in the Levant. It has been cultivated in England since 1562.

Of the two great families of lettuce, the Cos varieties, which grow upright and of an oblong shape, and require

Fig. 125.

blanching, though more esteemed in England, do not generally succeed so well in this country, except at the South, where they may be sown early in October. The cabbage varieties are more hardy and free growing, and better adapted to our common gardens.

The following are good cabbage lettuces:

Butter or Early White Cabbage.—Heads small, white, crisp, and closely cabbaged; leaves pale yellowish

green; excellent for hot-bed culture, or open air; early and hardy.

Brown Dutch (Yellow Seeded).—Heads much larger; equally tender and excellent, and closely headed; with brownish green leaves.

The next variety, if sown at the same time with the above, will come into use about two weeks after them:

Royal Cabbage.—Black seed; heads larger, and leaves of a darker green than the early cabbage; equally firm and crisp.

After this comes on:

Curled India.—Leaf of a light yellow green, and very much curled; a very distinct sort; heads large and close, but not so fine and crisp as the other varieties, but will continue to head much later.

White Paris Cos.—Very large; leaves pale green, obovate, hooded at top, closing over and blanching a large heart without tying; becoming white, tender, crisp, and excellent; seeds white. Seeds should be saved only from those with leaves round, concave, and inclined to hood or turn inwards. The best summer sort.

Henderson's New York.—The heads are solid and large; dark green outside and light green inside. This lettuce is crisp and of fine flavor.

Boston Market.—Grows compact and produces a firm heart, with a beautiful color. The flavor is good. One of the best lettuces for forcing. There is a slight tinge of red on the margin of the leaves.

New Mammoth Salamander.—An improved form of lettuce with a compact head and capable of resisting the summer heat and droughts.

Deacon.—A good summer lettuce with large heads and thick leaves. When well grown the leaves of the heart turn to a bright yellow color; the leaves are crisp and tender.

HANSON.—This is a standard market variety, and produces a solid head with a fine flavor; crisp and tender. The color green outside with white inside.

GRAND RAPIDS.—For forcing under glass this lettuce stands near the head of the list. It retains its tender,

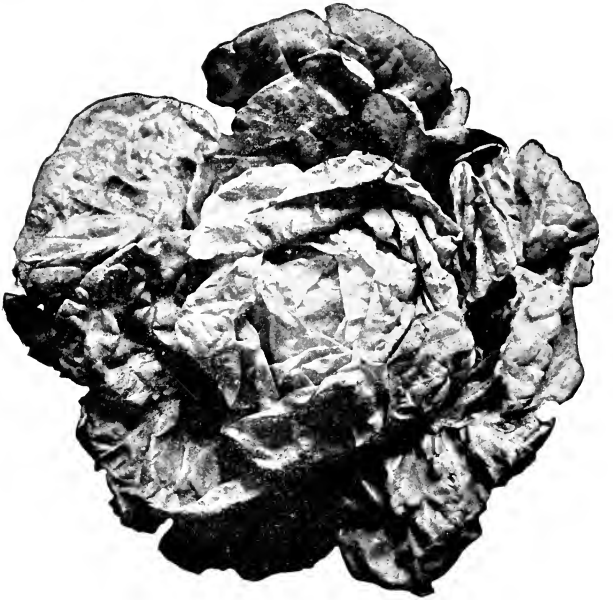


Fig. 126—New Mammoth Salamander Lettuce.

fresh condition for a long period. The heads are more open than the preceding.

Culture.—In raising good lettuce three things are necessary—good seed, good soil, and frequent hoeing—and of these the first is perhaps the most important. There is generally no difficulty in making lettuce seed vegetate, but if it is not saved from good heads it will not

produce heads, even with the best culture. Lettuce likes a good mellow soil, enriched with well-rotted manure. Good heads will not grow on poor ground. Lettuce may be sown in autumn for six or eight weeks before the hard frosts come on, and transplanted into frames for winter cutting, or, protected with a little straw, it will stand through the winter in the open air and be planted out for heading in early spring. A second sowing should be made at the first opening of spring, and then at intervals until the summer's heat comes on.

If there has been no fall sowing, a little should be sown the latter part of winter under glass, for which select Early Cabbage. Give it plenty of air, but keep it covered nights and cold days, and as the weather grows mild, leave off the glass altogether a little while before setting out in the open air. Fall-sown Butter lettuce may also be transplanted under glass at nine inches apart, and the table be kept supplied in this way with fresh heads all winter. Plenty of air must be given them, and they should be covered in freezing weather only. For a fall heading, a crop can be sown at the same time with turnips in a shady situation, which, being transplanted, will give good heads. The fall and summer sowings do much better if thinned to a suitable distance, and allowed to head where they stand, as lettuce plants are impatient of transplanting in hot weather; but they may be safely moved if shielded by sun shades.

Lettuce should be sown in drills eight inches apart. An ounce of seed will produce about ten thousand plants. Let the seed be very lightly covered, and if dry weather, press the earth upon it by walking over it on a board, or patting it with the back of the spade. Beds about four feet wide are most convenient. If the lettuce comes up too thickly in the drills it must be thinned, as the plants

begin to crowd, to two inches apart. Transplant into the ground where they are to remain, when the plants show four leaves. The Early Cabbage may be planted nine inches apart each way; but the other varieties will not do with less than a foot. The soil into which they are to be removed to head must be rich, light and mellow. Transplant in moist weather with a trowel, disturbing the roots as little as possible. Water the plants until established. Rabbits are very fond of lettuce, but can be kept off by dusting the young plants with ashes. After the young plants get established, give them frequent hoeings, and if good seed was sown, there can be but little danger of not being rewarded with beautiful crisp heads.

Seed.—Some of the finest and most perfect heads of the early-sown crops should be selected. Each variety must be kept separate, and all imperfect heading plants near them destroyed. Tie them to stakes, and gather the branches as fast as they ripen. Dry the seed in the shade and thresh and store in paper bags. Lettuce seed cannot be relied upon when more than two years old.

Use.—Lettuce is the most popular of all salads, and it is also sometimes used in soups. Boiled, it is quite equal to spinach. It is fit to boil from the time it is large enough until the seed stalk begins to shoot up. Its juice contains a narcotic principle somewhat like opium, which is in small proportion when young, but increases with the age of the plant. This principle has not the constipating effects of opium. A tea prepared of lettuce leaves is sometimes used in cases of diarrhea. For a common salad, let the leaves be carefully picked early in the morning, washed and drained before sending to the table, and provide salt, oil, sugar, and vinegar, that each person may season to his taste. The finer salads require hard-boiled eggs, mustard and other condiments.

MARKETING.—The heads are cleaned and all discolored leaves are taken off. Pack in crates with the heads down and well pressed together to prevent injury to the vegetable.

MARJORAM.—*(Origanum Onites and O. Marjorana.)*

There are four species, two of which are sufficient for the garden.

Pot Marjoram (*O. Onites*) is a perennial Labiate plant from Sicily. It is propagated generally by dividing the roots early in the spring, and may be by seed. Plants should be set in rows twelve inches apart, and ten inches in the row, in a light, dry soil, and a warm situation.

Sweet Marjoram (*O. Marjorana*) is a tender biennial commonly grown as an annual; a native of Portugal, and has been cultivated in England since 1573. It has small, acute leaves, and flowers in small, close heads. Sow in a slight hot-bed early in spring, and transplant when the frosts are over into rows nine inches apart and six inches asunder in the row; or it may be sown in shallow drills in the open air after the ground becomes warm. As the seed is small, cover lightly with fine earth and thin out the plants to the proper distance. The leaves, green or dried, are used for seasoning soups, stuffings, etc.

MELON, CANTALOUPE VARIETY.—*(Cucumis Melo.)*

The Melon, or Muskmelon, is a tender, trailing annual, of the same family as the cucumber, squash, etc. It is supposed to be from Persia, but has been cultivated in all warm climates so long that it is difficult to assign, with certainty, its native country. It has been cultivated in Southern Europe at least four hundred years. It is the richest and most delicious of all herbaceous fruits. In England its culture is a difficult and expensive process, but in this country the most luscious melons are raised almost without trouble.

Melons may be arranged in two classes, the green-fleshed and the scarlet-fleshed, the colors of the latter shading through orange to yellow. The varieties are very numerous. The best for garden culture are the green-fleshed, and the following are among the best varieties:

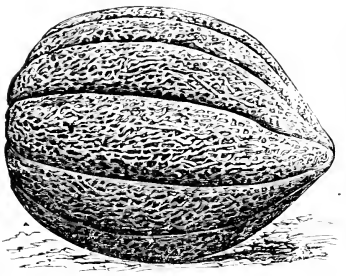


Fig. 127—Acme or Baltimore.

ACME OR BALTIMORE. Form oblong with perfect netting; excellent flavor; light green flesh; early and a fine shipper.

ATLANTIC CITY.—Pineapple shaped melon; large and showy; moderately ribbed; strongly netted; flesh green and sweet; larger than the Acme, and a good shipper.

GOLD JENNY, OR JENNY LIND.—Small, sweet and prolific; flat form at poles and medium cavity; texture coarse and soft; flavor excellent; early variety and highly prized for table use.

Fig. 128—McCleary's Improved Jenny Lind Muskmelon.

PINEAPPLE.

One of the best flavored melons of large size and oval shaped; prolific and strongly netted; the flesh is firm and coarse.

EMERALD GEM.—A delightfully flavored melon; small size, and dark green; the flesh ripens to the skin. An early, productive variety.

SHIPPER'S DELIGHT.—An early, good-shipping variety; green flesh, thick and fine flavored. The distinguishing feature of this melon is the button on the blossom end.

Culture.—The melon likes a rich, sandy soil, well manured and deeply dug. If the soil is clay, it should be corrected by the addition of charcoal-dust, sand, or leaf-mould from the woods. The most luscious melons are

Fig. 129—Emerald Gem.

grown on new land, fresh from the woods. They like, also, soil manured by cow-penning. In selecting seed, get the oldest to be had, and take great care to get that which is perfectly pure, for the seed of melons raised in proximity to gourds, cucumbers, pumpkins, etc., will produce new varieties, destitute of flavor. All plants of this family are exceedingly liable to intermix, to their great detriment. They will deteriorate, if planted within one hundred feet of each other.

Plant in the open ground when the frosts are over, a little later than the general corn crop is planted. In sections where the seasons are too short for it the melon is planted in pots in a hot-bed, and the maturity of the crop

may be hastened everywhere in this way. When the ground is warm, the balls are taken from the pots, and set where they are to remain, protecting them with sun-shades a little at first, or with hand-glasses, if cold. Have about three plants to each pot. In the open ground, plant in hills six feet apart, and ten seeds to a hill, an inch deep. Thin to three, and finally two, in a hill. Make the hills as for cucumbers. Superphosphate of lime has an almost magical effect in improving the size and hastening the maturity of the melon. The insects are the same as attack the cucumber, and a little guano sprinkled around the hill, not too near the plants, and intermingled with the surface soil, will by its pungent smell drive off the bug and flea, and also prove a very valuable fertilizer of the plants. Watering with guano water for the same purpose is very beneficial. Until the vines touch, keep the ground about them fresh dug, mellow, and free from weeds. When the vines begin to run, and show the first blossom they must be stopped by pinching off the extreme bud, as in the cucumber. This will render them earlier and more prolific in large fruit. Their whole culture is like that of the cucumber, and they may be forced in the same manner. In sections where the melon worm destroys the later grown fruits, get them into bearing as early as may be.

To Save Seed.—Select of each variety some of the earliest and best melons; wash the seed from the pulp, dry them in the shade, and put away in paper bags. They will keep ten years. Old seed is more prolific in fruit than new. Be sure to plant the oldest seed to be had, if it appears well preserved.

Use.—The melon as a palatable and luscious fruit, very cooling in hot weather, maintains a high rank. It is usually eaten with salt alone, though many like the addi-

tion of sugar and spices. That it is wholesome is proved by its constant use while in season as an article of food among the people of Southern Europe. The muskmelon contains but a trifle more water than the beet, and is quite as nourishing. It contains albumen, casein, dextrin and sugar, which, combined with citric, malic and tartaric acid, give its peculiar rich flavor. The green fruit may be cooked like the egg-plant, and is also made into mangoes.

MARKETING.—The smaller varieties are packed in vegetable crates and the larger in barrel crates. It is advisible to assort the melons and ship each variety in crates to itself.

MUSHROOM.

In writing the following description of the mushrooms the author has made liberal use of the Farmers' Bulletin No. 53, issued by the United States Department of Agriculture, prepared by William Falconer; Circular No. 13, issued by the Division of Botany by Frederick V. Coville, and Bulletins Nos. 138 and 168 issued by the Cornell University Experiment Station, by Professor George F. Atkinson.

The portion of the mushroom used for food is not the plant, but the fruit, which is developed from the white or bluish white mold, called the mycelium, or spawn, which is the plant proper. In its young condition this mycelium is a network of small threads running through the decaying organic matter, and from the joints of this thread-like form the mushroom springs and pushes to the light. Sufficient food and moisture must be given to these spawns to cause them to develop rapidly, and the mushrooms will come forth in abundance. Plate 4 exhibits the mycelium, or the thread-like spawns as they appear when the earth is washed away.

The mushrooms are very common in our forests and fields, some of which are poisonous, a number are edible,

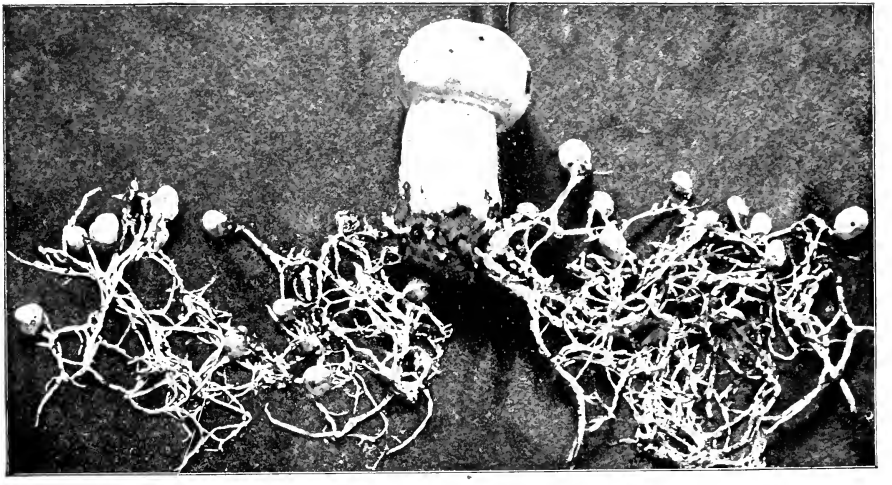


Plate 4—*Agaricus campestris*, L (after Atkinson). Common Mushroom. Soil washed from "spawn" and "buttons" showing the minute "buttons" attached to the strands of mycelium.

and the properties of many others are yet unknown. Until one is able to distinguish between the edible and those which are poisonous it is wise not to attempt to collect the mushrooms from the fields, but to rely only on the spawn supplied by well-known and reliable seed merchants. With a little practice, however, it is possible to recognize the more common forms, like the *Agaricus campestris* and the *Amanita muscaria*. And with proper care, on the part of an intelligent person, all danger of poisoning may be eliminated.

Fig. 130—Mushrooms. *Agaricus campestris*, L (after Atkinson). View of under side showing stem, annulus, gills and margin of pileus. Cornell Experiment Station.

COMMON MUSHROOM.

(Agaricus campestris, L.*)*

"Figure 130 is from a photograph of a specimen of the common mushroom (or pratelle) which has been pulled and is lying on the table. The parts are easily recognized and named. The stem (sometimes called the stipe) is cylindrical, or tapers a little toward the lower end. Near its upper end is a sort of a collar, usually termed a 'ring' (or, technically, an *annulus*), which encircles it. This ring is very delicate in this plant, is white like the stem, of a

very thin, satiny texture, and more or less ragged on the edge.

"The more or less circular expanded disk into which the stem fits is called the 'cap' (technically the *pileus*, which is the latin for cap). The upper portion, of which we can only see the margin in this figure, is convex (see Figure 130). The surface is usually white, though some-

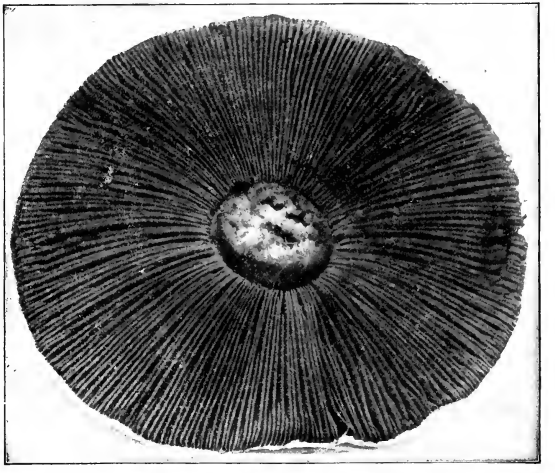


Fig. 131—*Agaricus campestris* (after Atkinson). View of underside of pileus, showing arrangement of gills.

times brownish, and usually is covered by a thin layer of very delicate threads, while the flesh or inner portion is more compact, and is white also.

"On the under side of the cap are numerous thin plates or 'gills' (*lamellae*), which radiate from near the stem to the margin of the cap. These are shown in Figure 131 as fine radiating lines. They do not reach the stem, or, when they do, they are not attached to it.

"The common mushroom (*Agaricus campestris*) grows in lawns, pastures and similar places. It averages 5-8 cm. (2-3 inches) in height, the pileus being 5-12 cm. in diameter.

"*Pileus.*—The cap or pileus is convex or more or less expanded, the surface being nearly smooth, or more or less silky hairy, these fibrils sometimes being collected into triangular scales. The color of the surface is usually white, but varies to light brown, while the flesh is white.

Fig. 132—Mushroom. *Amanita phalloides*, Fr. (after Atkinson). Poisonous Mushroom. White form, showing pileus, stipe, annulus and volva. Cornell Experiment Station.

"*Gills.*—When the plant is very young the gills are first white, but soon become pink, and later purple brown or dark brown from the numerous purple colored spores on the surface. The gills are free from the stem, and rounded on their inner ends.

"*Veil and Annulus.*—The veil is thin, white, silky and very frail. As the pileus expands the veil is stretched and finally torn, when it clings as a thin collar or ring (annulus) around the stem, or fragments dangle from the margin of the pileus. As the plant becomes old, the annulus shrivels up and becomes inconspicuous.

"*Stem or Stipe.*—The stem is white, nearly cylindrical, or slightly tapering at the lower end. It varies from 3-8 cm. long and 1-2 cm. in diameter. The flesh is solid, though less firm at the center." (*Atkinson.*)

AMANITA PHALLOIDES, Fr. (*The Deadly Amanita*).—This mushroom may be mistaken for the *Agaricus campestris* by the careless collector, but there are marked differences between the two when examined. In the first place, the habitat of the Amanita is in the woods, while the Agaricus is to be found in the open fields. The former also has a cup-like envelope, in which the base of the stem rests. This cup is called the "death cup" or "poison cup" or volva. The volva is the distinguishing characteristic of the poison forms, and whenever the mushrooms contain it they should be avoided. The Amanita is sometimes found on the borders of the woods, closely situated to the edible forms, and this fact should be always carefully remembered when out on a collecting tour. Be careful to dig up the entire stem, so that the volva may be certainly detected if present, because it is often true that the stem extends some distance below the surface of the ground and the poison cup may be overlooked if the mushroom is pulled up by the pileus.

THE FLY AMANITA (*Amanita muscaria* (L) Pers).—In this mushroom the bulbous enlargement at the base of the stem is clearly indicated, and this, with the following characteristics, distinguish this poisonous species from those which are edible, viz.: The thick scales on the stem, the corky particles on the glossy surface of the cap, and the broad, dropping ring at the top of the cap. The color of the upper surface of the cap varies from a brilliant red to orange-yellow, buff, and even white. Sometimes the corky layer does not break up into particles, but extends over the entire surface of the cap, and might be mistaken by the novice to be another species. This is one of the

most dangerous mushrooms growing wild, and too great care cannot be exercised by the collector in watching out for it in securing those mushrooms which are intended to be used for the table.

Fig. 133—Fly amanita, *Amanita muscaria* (after Coville). Poisonous. One-half natural size

The effects from the poisons taken into the system by accidentally eating these poisonous mushrooms are so violent and generally fatal, the following symptoms and treatment, recommended by Mr. V. K. Chesnut, are given.

The poisonous principle of the death cup is known as phallin, and is of the same character as the violent poisons found in rattlesnakes and some other animals:

"The fundamental injury is not due, as in the case of muscarine, to a paralysis of the nerves controlling the action of the heart, but to a direct effect on the blood corpuscles. These are quickly dissolved by phallin, the blood serum escaping from the blood vessels into the alimentary canal, and the whole system being rapidly drained of its vitality. No bad taste warns the victim, nor do the preliminary symptoms begin until nine to fourteen hours after the poisonous mushrooms are eaten. There is then considerable abdominal pain and there may be cramps in the legs and other nervous phenomena, such as convulsions, and even lockjaw or other kinds of tetanic spasms. The pulse is weak; the abdominal pain is rapidly followed by nausea, vomiting, and extreme diarrhea, the intestinal discharges assuming the 'rice-water' condition characteristic of cholera. The latter symptoms are persistently maintained, generally without loss of consciousness, until death ensues in from two to four days.

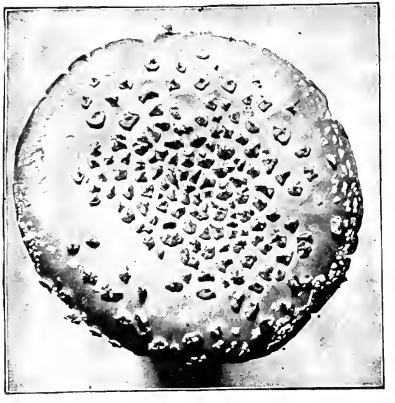


Fig. 134—Fly amanita, *Amanita muscaria* (after Coville). Top view. Poisonous. Two-fifths natural size.

"There is no known antidote by which the effects of

phallin can be counteracted. The undigested material, if not already vomited, should, however, be removed from the stomach and intestines by methods similar to those given for cases of poisoning by *Amanita muscaria*.

"After that the remainder of the poison, if the amount of phallin already taken up by the system is not too large, may wear itself out on the blood and the patient may recover. It is suggested that this wearing-out process may be assisted by transfusing into the veins blood freshly taken from some warm-blooded animal. The depletion of the blood serum might be remedied by similar transfusions of salt and warm water.

"The symptoms of poisoning from the fly amanita, as deduced from a number of cases, are varied. In some instances they begin only after several hours, but usually in from one-half to one or two hours. Vomiting and diarrhea almost always occur, with a pronounced flow of saliva, suppression of the urine, and various cerebral phenomena beginning with giddiness, loss of confidence in one's ability to make ordinary movements, and derangement of vision. This is succeeded by stupor, cold sweats, and a very marked weakening of the heart's action. In case of rapid recovery the stupor is short and usually marked with mild delirium. In fatal cases the stupor continues from one to two or three days, and death at last ensues from the gradual weaking and final stoppage of the heart's action.

"The treatment for poisoning by *Amanita muscaria* consists primarily in removing the unabsorbed portion of the amanita from the alimentary canal and in counteracting the effect of muscarine on the heart. The action of this organ should be fortified at once by the subcutaneous injection by a physician of atropine in doses of from one one-hundredth to one-fiftieth of a grain. The strongest emetics, such as tartarized antimony or apomorphine

should be used, though in case of profound stupor even these may not produce the desired action. Freshly ignited charcoal or two grains of a one per cent. alkaline solution of permanganate of potash may then be administered, in order, in the case of the former substance, to absorb the

Fig. 135.—*Coprinus atramentarius* (after Atkinson). Scaly form. Three-fourths natural size.

poison, or in case of the latter, to decompose it. This should be followed by oils and oleaginous purgatives, and the intestines should be cleaned and washed out with an enema of warm water and turpentine.

"Experiments on animals poisoned by the fly amanita and with pure muscarine show very clearly that when the

heart has nearly ceased to beat it may be stimulated to strong action almost instantly by the use of atropine. Its use as thus demonstrated has been the means of saving numerous lives. We have in this alkaloid an almost perfect physiological antidote for muscarine, and therefore in such cases of poisoning its use should be pushed as heroically as the symptoms of the case will warrant.

"The presence of phallin in *Amanita muscaria* is possible, and its symptoms should be looked for in the red color of the blood serum discharged from the intestines."

THE INK CAP (*Coprinus atramentarius*, Fr.).—This is one of the edible fungi, or mushrooms, and is quite abundant in new-made lawns that have been heavily manured, generally in large clusters, but sometimes found scattered as single plants. The figure gives a very correct representation of this mushroom. The pileus is egg-shaped, sometimes smooth and then again covered with small scales, or in other cases the surface has a granular cast. The stems are short.

SHAGGY OR MANED INK CAP (*Coprinus comatus*, Fr.).—Edible, and found growing on lawns and rich grass plats. The stem is longer than those of the ink-cap mushroom, and the pileus is very shaggy, and the pileus remains most of its life in a cylindrical form and does not expand into the umbrella shape as is the case with most of the other mushrooms.

Culture.—Beds may be readily constructed at any time of the year, except between April and September, when the temperature is rather too high for successful culture, unless in the cool cellar of some outhouse. But November and December are the best months for the purpose. Mushrooms are propagated by spawn, which may be obtained for commencing from the seedsmen of our large cities. The spawn is an imported article, and there is but little,

Fig. 136—*Coprinus comatus* (after Atkinson), well meriting the name "shaggy mane." Natural size.

if any, grown in this country for sale. There are two forms—the English brick and the French flakes. The bricks are broken into small pieces and the flakes are also subdivided before planting.

After a little spawn is obtained, it may be increased as follows: Take a quantity of fresh manure from high-fed horses, mixed with short litter; add one-third cow's dung, and a good portion of loamy mould. Incorporate them thoroughly, mixing them with the drainings of a dung heap, and beat them until the whole becomes of the consistency of a thick mortar. Spread the mixture on the level floor of an open shed, and beat it flat with a spade. When it becomes dry to the proper consistency, cut it into bricks about eight inches square; set them on edge and turn frequently until half dry, then dibble two holes about half through each brick, and insert in each hole a piece of good spawn; close it with a moist composition similar to that of which the bricks were made, and let them remain until nearly dry. Then some-

where under cover place a bottom of dry horse-dung six inches thick, and place the bricks, spawn side up, one upon another. The pile may be made three feet high; cover it with warm horse-dung sufficient to diffuse a gentle heat through the whole. The heat should not be over 70°, and the pile should be examined the second day to see that it does not overheat. When the spawn is diffused entirely through the bricks the process is finished. The bricks should then be laid separately in a dry place, and if *kept perfectly dry*, retain their vegetative power for many years. One bushel of spawn will plant a bed four feet by twelve.

Beds for mushrooms may be made anywhere in a dry situation under cover. Make them four feet wide and from ten to fifteen feet long, according to the wants of the family. A small shed might be erected for the purpose, but the back of a greenhouse is a very good situation, as they do not need much light. Space must be left for an alley, and if the shed be ten feet wide, it will admit of a bed on each side.

Mushrooms, like other fungi, abound in nitrogen; hence, this substance is necessary to their nourishment, and unless substances rich in nitrogen, like horse dung, are supplied, it is useless to attempt their culture. Earthy materials are added to prevent the escape of ammonia, which would pass off in fermentation, and the substances used are beaten and trodden to render the mass compact, that fermentation may be slower and more lasting. The process of making the beds is as follows:

A sufficient quantity of the droppings of hard-fed horses, pretty free from litter, must be obtained, which, while collecting, must be kept dry, and spread out thinly and turned frequently to prevent violent heating. When the rank steam has escaped, the bed may be built. The site should be dry. Dig out the earth six inches deep, the

size of the bed, and if good lay it aside for use. Fill this trench with good fresh dung for the bottom, and lay on this the prepared dung, until the whole is six inches thick above the surface; beat it down firmly with the back of the fork, and build up the sides with a slight but regular slope. Let the bed slope downwards towards the walk, lay over it three inches of good clayey loam; place another layer ten or twelve inches thick of prepared dung, and in the same manner continue until the bed is two and a half or three feet thick. Cover the bed with clean litter, to prevent drying and the escape of the gases, and let it remain ten days, or until the temperature becomes mild and regular; about 60°, and certainly not less than 50°, is the proper degree of warmth. Here skill and practice are most required, for on the treatment at this precise point the success of the bed depends. If the manure has a brown color, and is so loose and mellow that when pressed it will yield no water, but has a fat, unctuous feel, without any smell of fresh dung, the bed is in a right state. If it is dry and hard, or sloppy and liquid, it is not in the proper condition. In the first case moderate watering may restore it, but in the latter the superabundance of water will probably spoil it, and it is better to commence anew. When the bed is ready, break the bricks of spawn into lumps the size of a walnut, which plant regularly six inches apart over the surface of the bed, including its sides and ends, just beneath the surface of the manure. Level the surface by gently smoothing with the back of the spade. Fine rich loam, rather light than otherwise, is then put on two inches thick; and over this, a covering of straw from six to twelve inches, according to the temperature. If the bed gets too hot, take off most of the covering. When the bed appears too dry, sprinkle it gently with soft tepid water in the morning. The water should be poured through the rose of a watering-pot upon a thin layer of

straw, laid on for the purpose, and when the earth becomes a little moistened, the straw should be removed, and the dry covering replaced. In warm weather it will need frequent sprinkling, but in winter very little.

As cow-manure, though it contains less ammonia, retains its heat longer than that of the horse, a mixture of the two may be safely employed.

In four or five weeks after spawning the bed should begin to produce, and if kept dry and warm will last several months. A gathering may take place two or three times a week according to the productiveness. If it should not come on in two or three months, a little more warmth or a sprinkling of water will generally bring it into plentiful bearing, unless the spawn has been destroyed by overheating or too much moisture. In gathering the mushrooms detach them with a gentle twist and fill the cavity with mould; do not use a knife, as the stumps left in the ground become the nurseries of maggots, which are liable to infest the succeeding crop. Gather before they become flat, when half an inch or more in diameter, and still compact and firm.

Use.—This "voluptuous poison" has been cultivated and held in high esteem among epicures since the time of the Romans. They are employed in catsups, pickles, and rich gravies, and considered by those accustomed to them very delicious. Dried and powdered they are preserved in closely stopped bottles for times when they are not to be procured fresh.

MUSTARD.—*(Brassica alba*, and *B. nigra.)*

The leaves of the White Mustard (*S. alba*) are used for salads, and the seed of the Black Mustard (*S. nigra*) furnishes the well-known condiment. Both are hardy annual Cruciferous plants, and succeed in any good common loam, but where sown in September to stand the winter,

as is common in the South for early greens, the soil should be rather dry. White mustard may be sown any time of the year for a salad, in the same manner as cress, which see. It must be used when the seed-leaf is just expanded, for if it gets into the rough leaf it is fit for nothing but greens. For use, cut them off with a sharp knife. They should be used soon after gathering. Mustard for greens or for seed should be sown broadcast or in drills eighteen inches apart, to be finally thinned to about a foot in the drill. The leaves at the South are gathered the latter part of winter or in early spring. Keep the ground free from weeds. When grown for seed, gather when the pods change color, and thresh when dry.

Besides the White and Black species there are several varieties which are used in many portions of the South. The Southern giant curled is most popular.

Use.—The tender leaves of both species are used for salads, and should be more cultivated for this purpose. They are also much cultivated for greens. The seeds of the white variety, ground, form the Durham or London table mustard, but the flower of the black sort is that from which our American table mustard is, or ought to be, made. The seeds may be ground in a common spice mill or crushed by a roller on a table. In this country the flour is usually sifted after grinding, but the French do not separate the husk, and thus make a brownish flour, more powerful and palatable than the other. Mustard is a very agreeable condiment, assisting digestion and promoting appetite. The seed used whole is an excellent seasoning to various kinds of pickles. It is also much used in medicine, both by the faculty and in domestic practice. It is an acrid stimulant, and in large quantities acts as an emetic. The proper dose for the latter is from a teaspoonful to a tablespoonful in a glass of water. Mustard is a local excitant applied to the skin in a cataplasm, made of

the ground meal with vinegar or lukewarm water. *If mixed with boiling water the acrid principle will not be developed.*

NASTURTIUM, or INDIAN CRESS.

(Tropæolum majus and T. minus.)

There are two species—the Large Nasturtium (*T. majus*) and the small Nasturtium (*T. minus*)—both from Peru, where they are perennials, but are here treated as annuals. The large species was introduced into England in 1681. The stalks are long and trailing; the leaves have their petioles fixed at the center. Flowers helmet-shaped, of a rich, brilliant orange, and continue from their first appearance all summer; and if not so common would be thought very beautiful. The small sort is preferable for the garden, being productive and needing no support.

Culture.—Nasturtiums flourish in a moist soil, but do best in a good, fresh loam. If the soil is too rich the plants are luxuriant, but do not bear so abundantly, and the fruit is of inferior flavor. Give them an open situation. Sow in spring when the ground gets warm; put the seeds an inch deep and four inches apart, covering them three-fourths of an inch. The seed must be of the preceding year's growth. They may be sown by the side of a fence or trellis. If more than one row is sown, they should be at least four feet apart. Thin the plants, when they are well up, to a foot in the drill. Hoe the ground well, and keep down the weeds. If sown in the open ground, support them as you would peas with lattice or brush. Give the plants a little assistance in fastening themselves to the trellis. Water in dry weather. Gather the fruit when full grown, but while still fresh and green.

For Seed.—Let some of the berries mature, gather them as they ripen, spread them to dry and harden, and store in paper bags.

Use.—The flowers and young leaves are used in salads, and have a warm taste like water cress. The flowers are used in garnishing dishes. The fruit, gathered green and pickled, forms an excellent substitute for capers.

OKRA.—*(Hibiscus esculentus.)*

This is an annual Malvaceous plant, a native of the West Indies, and much esteemed and cultivated wherever its merits are known. There are several varieties—the round, smooth green, and the long fluted or ribbed white, which grow tall, also the dwarf. There is no great difference in quality, but the dwarf sort is best for gardens. The White Velvet is a prolific bearer, and well suited to the South. It has extra large smooth white pods in abundance.

Okra likes a good, dry soil. Any soil will produce it that is good enough for the cotton plant, which belongs to the same natural family. The pods are not as pleasant nor as early on over-rich soil. It is not planted until the frosts are over, as it is tender, though it often comes up from self-sown seed. The time of planting cotton or snap beans is a very good guide, though some may be put in as an experiment two weeks earlier. Make the drills three feet apart, sow the seed rather thinly, and thin out to two feet apart in the drill. Those thinned out may be transplanted and will make productive plants. No seed should be allowed to ripen on those stalks from which the pods are gathered for eating. As fast as the pods become hard or unfit for use, cut them off, for if left on, the stalk will cease to be productive. If not allowed to ripen seed, the plants will continue bearing through the season. The dwarf okra may stand about fifteen inches apart in the drill, and it is well when any plant begins to fail in productiveness to cut it down to a foot from the ground, and it will soon throw up bearing shoots.

To Save Seed.—Leave some of the earliest plants to ripen seed, if you would have this vegetable in good season. Shell out the seed, and stow away in paper bags.

Use.—The pods gathered in a green state, and so tender as to snap easily in the fingers, are the parts employed in cooking. If old, they are worthless. They are very wholesome, considerably nutritious, very mucilaginous, and impart an agreeable richness to soups, sauces, and stews. They are also simply boiled in salt and water, and served up with butter, pepper, etc. Okra can be preserved for winter use by putting down the pods in salt like cucumbers, or by cutting them into thin slices and drying like peaches. When dry, put up in paper bags.

THE ONION.—*(Allium Cepa.)*

The genus *Allium* contains several of the most useful plants of our gardens. In it, besides the proper onions, are included the Garlic, Leek, Rocambole Shallots, and Chives, which are treated of in their several places.

VARIETIES.—There is a great number of varieties of onions, among which are:

YELLOW STRASBURG.—Large yellow, oval; often a little flattened, very hardy; keeps exceedingly well. Best for winter use at the South. Flavor strong.

YELLOW DANVERS.—Middle size, roundish oblate; neck slender; skin yellowish-brown; early and good; keeps well.

SILVER-SKINNED.—Of smaller size, but finer flavor, silvery white, flat, and very much used for pickling on account of its handsome appearance and mild flavor.

RED AND WHITE BERMUDA.—These are foreign varieties, and they possess good qualities. The red Bermuda is a very early onion. The white is a good-sized flat onion of fine quality.

WHITE QUEEN.—A silver-skinned onion and excellent for pickling; a rapid grower; very early and fine quality.

LARGE RED WETHERSFIELD.—The skin is red, while the interior is white; flavor strong, and the keeping qualities are excellent; an early variety and a heavy yielder.

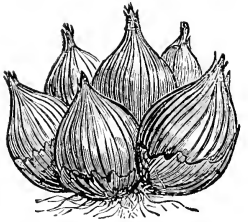


Fig. 137—Potato Onion.

PRIZE TAKER AND GIANT ROCCA.—The first is a Spanish and the latter an Italian variety. Both produce large onions. The Prize Taker has a yellow and the Giant Rocca a red skin. The flavor is good in the case of each, and the flesh is tender. The first is a fine onion for the South.

EXTRA EARLY RED.—A very early onion growing to a medium size; close grained and solid.

SOUTHPORT WHITE GLOBE.—Globular onion of a mild flavor and good keeping qualities. Highly prized in some sections of the South.

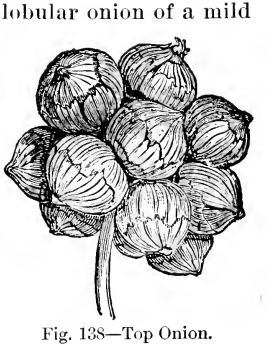


Fig. 138—Top Onion.

POTATO ONION.—This derives its name from forming a number of bulbs on the parent root beneath the surface of the soil. It ripens early, but does not keep until spring. A sub-variety with smaller bulbs is said to produce bulbs on the stem like the top onion. It is very prolific, and affords a supply before other kinds are ready. Plant the offsets in rows a foot apart, and ten inches in the row, three inches deep, from October to March.

Top or Tree Onion (*Allium Cepa. var. viriparum*).—Is said to have originated in Canada. It produces little bulbs ("buttons") at the top of the seed stems; hence its name "Tree Onion." This is the easiest to manage of any of the onions; is of good, mild flavor, early and productive with little care, so that it is a favorite in climates too cold and too warm for the other varieties. Plant the buttons from October to March in drills one foot apart and six inches in the drill. Plant the apex of the button just beneath the surface of the soil. The small top bulbs are fine for pickling.

Ciboule or Welsh Onion (*Allium fistulosum*).—Of two kinds—white and red; is quite distinct from the common onion, and does not bulb. It is sown in September for drawing early in spring. Flavor strong, very hardy.

Thompson describes twenty sorts of onion, of which the foregoing are the best. Of these the first two and the top onion are to be preferred for general use.

Culture.—The method of cultivating the onion has undergone quite a change since 1867, when this work was passing through its second edition. Then it was the universal custom in the South to raise onions from seeds planted immediately in the open garden, where the crop was to be matured. The sowing was done in February in beds richly manured, and the plants matured the onions about May or June. This method is still in practice in some localities, but generally it is now superseded by what is known as the "New Onion Culture." This method consists in sowing the seeds in cold frames in December or in hot-beds in January, and as soon as the young plants produce bulbs one-quarter of an inch in diameter, and when the season is far enough advanced, they are transplanted in the field or garden in rows two feet apart and three to four inches in the rows. This method of cul-

tivation insures extra size to the onion, earliness in the crops and an improvement in the flavor.

The transplanting is rapidly accomplished by the use of a dibble, made of a piece of wood one inch square and six inches long, shaved to a flat point at one end, and a cross piece fastened to the other for a handle. A line is stretched and the seedlings are planted by pressing the dibble in the soil and pushing from the person, inserting the plant in a vertical position, removing the dibble and firming the earth about the plant. Very rapid work can be accomplished in this manner, and a great many plants can be transplanted from the frames to the garden in a day. In the use of the hot-beds it will be necessary to harden the plants before transplanting by opening the frames during mild days in February or a short time before the plants are taken up, in order to harden them and accustom them to the change. When the plants are to be cultivated with the plow it will be best to make the rows three feet apart.

The onion requires a rich, friable soil and a situation enjoying the full influence of the sun, and free from the shade and drip of trees. If the soil be poor or exhausted, an abundance of manure should be applied some time before planting and thoroughly incorporated with it; for rank, unreduced dung is injurious, engendering decay. If applied at the time of planting, the manure must be thoroughly decomposed, and turned in only to a moderate depth. If the ground be tenacious, sand, or better still, charcoal-dust, is advantageous; ashes and soot are particularly beneficial. Common salt, at the rate of six to eight bushels per acre, is an excellent application to this family of plants. In digging the ground, small spadefuls should be turned over at a time that the texture may be well broken and pulverized.

An analysis of the onion shows that it takes from the

soil potash, phosphoric acid and nitrogen, so that it will be necessary to apply a fertilizer which has these ingredients in its composition. The following formula will be found sufficient for an acre of good average land, where the rows are one foot apart; if two feet apart one-half the quantity will suffice:

Phosphoric acid	600 pounds.
Muriate of potash	200 pounds.
Cotton-seed meal	1,000 pounds.
Nitrate of soda	200 pounds.

The onion can be grown in great perfection in the South, and it does not require a change of soil, being an exception to the general rule that plants like a rotation, as they have been grown in Scotland a century on the same land without any diminution of the crop. Of course, the land must be kept well fertilized with stable manure, or where commercial fertilizers are alone used it will be necessary to turn under a crop of pea-vines now and then to give the needed humus. A top dressing of unleached ashes before the onions are planted will be found very beneficial. The ashes must be incorporated with the soil thoroughly before transplanting. Nitrate of soda applied broadcast after the plants have begun to grow well will add much to the value of the crop.

It is a good plan to make the beds just wide enough for three rows, say thirty inches wide, with a narrow alley between, which may be filled with sweet corn or cabbages after the crop is laid by.

But in common gardens beds four feet wide and the rows thereon twelve to fourteen inches wide are most convenient. The soil of the beds must be finely dug, the surface rolled smooth, and all the clods beat fine that may have escaped the spade. The drills should be drawn very shallow, as the best onions grow upon the surface of the ground. For this reason, it is well to roll the bed, or beat

it smooth with the back of the spade, before making the drills. In seeding in the open garden do not sow very thickly—only one or two seeds in a place. A seed every inch is quite thick enough, as thinning out, when too thick, is apt to injure the remainder. Cover the seeds about half an inch with fine sifted soil, and press down the earth upon them by a roller, or walking over them on a plank.

When they come up, thin them out gradually in the drills to six inches apart. Keep the bed clean and free from weeds, and stir it frequently, but not deeply, with a hoe. Do not hill the earth up against the bulbs; but draw it away from them with the fingers, as they keep better if grown pretty much above the ground. There is no crop more easily raised or preserved, if the ground is rich enough, and the bulbs made to grow upon the surface. After the young onions have got a good start, it is best to drop the hoe entirely and resort to hand-weeding. In dry weather, a thorough drenching in weak liquid manure, or soapsuds, is excellent. For pickling, the white kind should be sown much more thickly, and thinned out until about one or two inches apart in the row, which will cause them to ripen early, before they have become too large.

If onions grow thick-necked, and do not bulb properly, bend down the stems about two inches above the neck, to the ground, without disturbing the roots. This is needful only in very wet seasons.

When the crop is ready for harvesting, it is known by the drying up and change of color of the stems.

To Preserve Them.—Pull them on a dry day, dry them thoroughly in the shade, and stow them in a loft where they can have plenty of air. When thoroughly dry they can be strung in ropes, made by braiding the tops to-

gether. From two to five hundred bushels per acre is the usual crop.

For Seed.—Select the largest and finest bulbs and plant out in the fall about twelve inches apart, in beds of common garden soil, not too rich. Keep them free from weeds; and when they throw up seed stalks support them by poles laid horizontally on stakes, six or eight inches above the surface of the beds. Home-grown seed from good bulbs is as good as the best imported. It will keep three years, but the fresh grown seeds are preferable. Onion buttons are grown in the same manner upon the Top Onion.

Use.—Onions are among the most useful products of the garden. They are used especially as a flavoring ingredient and seasoning for soups, meats, and sauces; for which purpose they have been employed from time immemorial. They contain considerable nutriment, and are tolerably wholesome, especially if boiled. Onions, like *all other vegetables*, need to be slightly salted *while cooking*, or their sweetness will be mostly lost. Raw, they are not very digestible, and they are the same if fried or roasted. Eating a few leaves of parsley will destroy in a measure the unpleasant smell they impart to the breath.

MARKETING.—The early crop should be gathered in March, tied five or more in a bunch, and packed in crates. With this early green crop the tops are left on, but with the later dried onions the tops are cut off before packing.

ORACH.—*(Atriplex Hortensis.)*

A hardy annual, of the same natural family as the beet and Jerusalem oak (*Chenopodiaceæ*), a native of Tartary, and first cultivated by English gardeners in 1548. The stem rises three or four feet high, with oblong, variously shaped leaves, cut at the edges, thick, pale green, and glaucous, and of slightly acid flavor; flowers of

same color as the foliage. There are two varieties—the pale green and the red or purple leaved, the latter of which is just now coming into fashion as an ornamental plant, on account of the fine color of its foliage.

Culture.—Orach flourishes best in a rich, moist soil. It is raised from seed sown in drills, fifteen to eighteen inches apart. Sow very early in spring, or in October, which is a good time in mild climates. Two or three sowings may be made in spring for a succession. The plants soon make their appearance; when an inch high thin them to four inches asunder. Those removed may be replanted, being watered occasionally until established. Hoe them in a dry day, keeping the ground loose and free from weeds. Once established, it sows itself.

Use.—The leaves and tender stalks are cooked and eaten like spinach, to which they are preferred by many. They must be gathered while young, or they are worthless. The seed should be gathered before fully ripe, as they are liable to be blown away by wind.

PARSLEY.—(*Petroselinum sativum.*)

Parsley is a hardy, biennial, Umbelliferous plant from Sardinia. There are two varieties used in garnishing—the common parsley, with plain leaves, which is the hardier sort, and the Champion Moss Curled, which is much handsomer and longer in running to seed.

The Market Gardeners' Parsley is a variety quite popular, the leaves of which are beautifully curled.

The Neapolitan or Celery-leaved is grown by the French for the leaf-stalks, which they blanch and use like celery.

The Hamburg Parsley (*var. latifolium*) is cultivated for its fleshy roots, which are eaten like parsnips.

Parsley is raised only from seed, which may be sown in autumn or spring, until the weather and soil are too

dry and hot, when it will come up readily. It is best to sow it pretty early, as the seed remains long in the soil before vegetating. The beds must be made annually, if the plants are allowed to run to seed; but if the seed stalks are cut down as often as they rise, the plants will last many years. Many sow parsley as an edging to other beds or compartments. If in beds, it is better to sow in drills ten inches apart. Any good garden soil is rich enough for this plant. Pulverize the bed by thorough spading, and rake it level before making the drills. Sow the seed moderately thick in drills half an inch deep, and press fine soil upon it. The plants will not come up in less than three or four, and sometimes six weeks. If sown late give it a shady border. Should the bed get weedy before the parsley appears pull the intruders out by hand. As soon as the rows can be seen, hoe between them, and draw a rake crosswise to break the crust which has been formed, and the plants will grow vigorously. They will be fit for use when two or three inches high. When they get strong thin them out to three inches, and finally to nine inches apart, being careful to reject all plants from

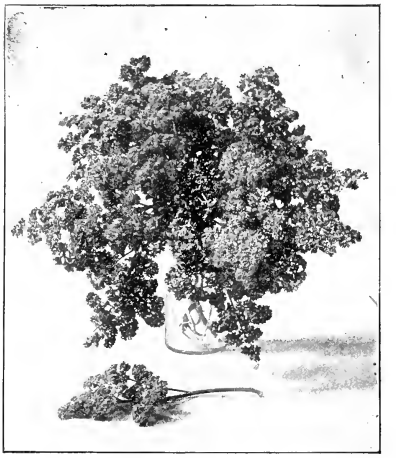


Fig. 139—Market Gardener's Parsley.

the seed-bed that are not nicely curled. If they grow too rank in summer, cut them near the collar.

A bed six feet long by four feet wide is large enough for almost any family. It is best to appropriate to it such a bed, where it will sow itself and yield a constant succession of new plants. The plants should have the stems cut down, if growing rank, three or four weeks before heavy frosts are expected, that fresh growth may be thrown up for winter and early spring use. It is well to protect the plants with a little coarse litter in cold climates, but this is not necessary south of Virginia.

To Save Seeds.—Allow some of the finest curled plants to throw up seed-stalks; let them stand eighteen inches apart; when the seed ripens it may be stored in a dry place. It will keep good several years, and it is singular that seed four years old will come up more quickly than that gathered six months before sowing.

Use.—Parsley is a very agreeable and useful plant, affording a beautiful garnish. It is also used for its aromatic properties in seasoning soups, stews and meats. The green leaves eaten raw diminish the unpleasant smell of the breath after eating leeks and onions. It can be dried in summer, pounded fine, and put away in bottles; but this is of no use in mild climates, where fresh green parsley can be had all winter from the garden.

PARSNIP.—*(Pastinaca sativa.)*

This is a hardy, biennial, Umbelliferous plant, of which the wild variety is found in various parts of Europe, and it is not rare in this country as a weed. It has long been cultivated. In its wild state, it is said to have poisonous properties; but it is rendered by cultivation sweet, palatable, and very nutritious for man and beast. The garden parsnips have smooth and light-green leaves, while those of the wild variety are dark-green and hairy; but the two

do not differ so much as the wild and cultivated carrot. By ten years' culture Professor Buckman, in England, succeeded in producing the garden variety from the wild sort. This plant is of the hardiest nature, being improved by remaining in the ground exposed to frost during the winter. The best variety for the garden is the Hollow-Crown or Sugar Parsnip. Its roots are smoother, more handsome, and better flavored than the other varieties. It is distinguished by the cavity which crowns the root.

Fig. 140—Ideal Hollow-Crown Parsnip.

Parsnips like a rich, sandy loam, the more deeply dug the better. They do exceedingly well on rich bottom lands, but do not succeed well in stiff clays. The manure should be applied to a previous crop.

Parsnip seed can be sown any time in spring before the hot, dry weather comes on, which will prevent it from vegetating freely. Scatter the seed thinly in drills fifteen inches apart, and when the plants appear, thin them to ten or twelve inches asunder. The culture in other respects is the same as that of the beet. The roots in cold climates are taken up and stored, if required for use in frosty weather, but the flavor is improved by exposure to the winter frosts, and they are commonly left where grown until spring, when, if taken up before growth commences, they will keep some weeks.

For Seed.—A few of the best roots may be taken up and set out two feet apart in a border; but they do better to remain undisturbed. The seeds cannot be depended on for more than one year.

Use.—The parsnip is a very wholesome and nourishing root, though its peculiar sweetish taste is disliked by many persons. It is, however, an agreeable addition to our supply of winter vegetables. Its fattening properties are great, and it is therefore an excellent root for feeding all kinds of farm stock. Cows fed upon it will yield milk abundantly, and butter of the best quality.

PEA.—(*Pisum sativum.*)

This is a hardy Leguminous annual, probably from the Levant, where the gray field variety is found wild, but it has been cultivated from time immemorial. It is a climbing plant, producing its seeds in pods, which usually grow in pairs. The pea is now one of the most desirable culinary plants. Numerous varieties have been originated, differing in the color of the blossoms, height, time of ripening, and also in productiveness. Among the best are: Alpha, American Wonder, Yorkshire Hero, Horsford's Market Garden, Champion of England, Premium Gem, which are wrinkled peas. The earliest of these are Alpha, American Wonder, Premium Gem. Other varieties of very early peas are Alaska, Daniel O'Rourke, Eclipse, Tom Thumb. Some of the best late peas are Champion of England, Horsford Market Garden, Blackeyed Marrowfat, White Marrowfat, Yorkshire Hero, Pride of the Market. All these varieties have been tested by the experiment stations, and were found to be well suited to the climate of the South. The Blackeyed Marrowfat seems to bear the summer's heat better than most kinds, and is good flavor. The Alpha and Alaska are the earliest varieties of those mentioned. The following are dwarf

varieties: Alaska, Alpha, American Wonder, Daniel O'Rourke, Premium Gem, and Tom Thumb.

THE SUGAR PEAS are without the tough interior lining to the pod when young, and they will snap in two as readily as the pod of the kidney bean. There are two sorts—the Dwarf Sugar, about three feet high, with small crooked pods; and the Large Crooked Sugar, with large, broad, flat, crooked pods. The stems grow about six feet high.

As some families prefer white, others blue, some dwarf, and others tall sorts, it will not be difficult to make a selection from the foregoing list. There are some fifty sorts in the catalogues, but many of them are synonyms.

Potash and phosphoric acid are large constituents of the ash of the pea. Ashes and bone-dust, or super-phosphate of lime, especially the former, are likely to be the special manures most needed.

Culture.—A moderately rich and dry calcareous loam is best suited for the early pea and the dwarf varieties. The late peas and the lofty growers do better in heavier soil, and a cool moist situation. The manure should be applied early the preceding autumn, to be well reduced by the time the crop of peas is ready to feed upon it. In poor ground, fresh stable manure is better than none. If the ground, however, be extremely rich, there will be more vines than fruit. The soil must be deep, so that the roots may penetrate deeply to obtain moisture in time of drought, that the vines may not mildew. If the vines mildew or get too dry after they begin to blossom, the pods will not fill well. On this account it is found to be of advantage to plant in a furrow some six inches deep, as they continue much longer in bearing than when planted shallow.

The early crop may be planted as soon as the ground will do to work in the spring. And in the Cotton States,

where the winters are mild, American Wonder and Premium Gem peas may be planted from the last of November until March; Horsford's Market Garden, etc., in February; and the later kinds until early in April, and for a fall crop in August to come into use in October.

Near New York city they are planted from as early in March as the ground opens, until late in May. The distance of the rows apart will depend upon the variety. They should not be nearer to each other than the height to which the sort planted generally attains. Tom Thumb may be planted only fifteen inches apart from row to row, but as it is a branching sort, the plants may be five or six inches in the row. It is usual to plant in double rows, from nine to twelve inches asunder, leaving the distance above directed between each pair of rows. The sticks are set midway between the double rows, supporting the vines of both. It is maintained by many that from its more full exposure to the air and sun a single row will produce as much as two. The tall later sorts are far more fruitful if the rows are put twenty or thirty feet apart, and the space between occupied with other crops.

It is best to plant the early crop in rows running east and west, that the sun may warm the ridge of soil drawn up to the roots; but the rows of the main crop should run north and south. Early peas should be planted in the drills, about an inch apart; the medium growers an inch and a half; while for the tall kinds two inches are not too much. A quart of seed of these varieties will plant not quite fifty yards of double rows, while a quart of early peas will plant nearly seventy yards twice as thickly. The soil with which they are covered should be chopped fine, if lumpy, and in planting pressed upon the seed. Better delay a little than plant when the ground is wet. After the peas are about two inches high, hoe them well, drawing the earth a little toward them, and loosening the

soil between the drills, destroying every weed. Repeat this once or twice before brushing, which should be done when the plants are six or eight inches high, or as soon as the tendrils appear. This may be done by sharpened branches of trees prepared fan-shaped, and of a height proper for the pea to which they are to be applied, or stakes may be driven down every six feet each side of the drills, and lines of twine stretched from one to the other. Pea brush is, however, the best, as the vines lay hold of it more readily. It should be placed firmly in the ground between the drills. After brushing, draw up the earth on each side to help support the vine. Market gardeners do not employ brush or twine, but let them fall over and bear what they will. This does tolerably well with the early varieties, if the spaces between the rows be filled with straw or leaves.

Peas are forced by planting under glass in pots, to be transplanted, when the season permits; but in mild latitudes this is needless, as the pea, when young will survive a temperature but two degrees above zero if not in a state of rapid growth. If a hard frost occur when the plants are in bloom the crop is lost.

Seed.—The plants of the rows intended for seed should not be gathered from for any other purpose. When the pods begin to dry, gather and dry them thoroughly, and store the seed in bottles, pouring into each a little spirits of turpentine, as directed for preserving beans.

Some think that peas are earlier if the seed has been obtained from a more northern locality than the one in which they are planted. The garden pea is very wholesome, and an almost universal favorite. To have them in perfection, they should be freshly gathered, and by no means allowed to stand over night before use. They can be shelled and dried in the shade, and form a tolerably agreeable dish in winter, but they are much inferior to

those freshly picked. Green or dry they are very nutritious, abounding in flesh-forming constituents.

MARKETING.—In the far South peas are gathered for the market in March, at the time when a good price can be obtained if the pods are carefully picked and neatly packed. Do not pick until the pods are well filled and reject all those which are discolored or over-ripe. Pack in bushel crates. Fill the crates above the top and press the tops on firmly, so that the peas will be securely packed and the packages will be full when they reach their destination

PEPPER.—(*Capsicum.*)

This genus (*Capsicum*) of plants belongs to the Solanum family, and several species are in cultivation, all of which are natives of tropical regions. Some of them have been cultivated in England three hundred years, *C. annum*, or Guinea Pepper, having been introduced there in 1548. Those most in use are:

BELL PEPPER.—This was brought from India in 1759—of low growth, with large, red, bell-shaped fruit. Its thick and pulpy skin renders it best for pickles; more mild than most varieties. It is a biennial.

CAYENNE, OR LONG PEPPER.—Is a perennial, with small, round, bright red, tapering fruit, extremely pungent. Of this there is a large and small fruited sort, both excellent for pepper sauce, and to grind as a condiment.

LARGE SWEET SPANISH is a large, mild variety of annual pepper, much used in pickling.

TOMATO PEPPER is of two sorts, red and yellow, both tolerably mild; fruit tomato shaped.

Culture.—Capsicum likes a rich, moist loam, rather light than otherwise. Guano and fowl manure are excellent fertilizers for peppers.

For early plants, sow the seed in drills, one inch deep

and six inches apart, under glass, in February, and transplant after the frosts are entirely over, when three or four inches high, into good soil, in rows eighteen inches apart each way. Sow also in the open ground as soon as the settled warm weather comes on, say the last of March or first of April, and thin them out to the proper distance. An ounce of seed will give two or three thousand plants. They should be transplanted in moist weather only, and must be watered until well established. Shading a few days at midday, after transplanting, is very beneficial. Cultivate and earth up their stems a little.

Seed.—A plant bearing the earliest and finest fruit should be selected. The varieties should be grown as far apart as possible. When ripe, the pods are hung up to dry, and kept until the seed is wanted for sowing.

Use.—These plants are very much used in all hot climates, where they enter as a seasoning into almost every dish. The large kinds for pickling should be gathered when full grown, and just before turning red. They are also dried when ripe, and used for seasoning. Cayenne and the other small kinds are ground for table use, or made into pepper sauce by the addition of strong vinegar. Peppers are often rubbed upon meat to drive away insects. The daily use of this plant in hot climates is decidedly a preventive of bowel complaints, for which reason it is so universally cultivated in tropical regions.

Marketing.—Cut the peppers with short stems, so they will not dry out too soon and ship in vegetable crates.

POTATO (IRISH.)—(*Solanum tuberosum.*)

The Irish potato is a perennial plant, with a tuberous, subterranean stem, of the same genus with the eggplant, and nearly allied to the tomato. It is reported to have been brought into England from Virginia by Raleigh in 1586, but as he never visited Virginia, he probably ob-

tained it from some other portion of this continent. Though called the Irish potato, it is really a native of the western coast of South America, where it is still found wild, both "on dry, sterile mountains, and in damp forests near the sea," whence roots have recently been obtained differing very little from the cultivated varieties. Notwithstanding its excellence and complete adaptation to the English climate, it appears to have come slowly into use. Raleigh planted it on his Irish estate near Cork, but it is only within about a hundred years that its culture has been general, even in Ireland. In 1780 very few individuals in America raised as large a crop as five bushels. Of the numerous varieties now used the best, perhaps, for garden culture in the South are the following:

EARLY VARIETIES.—Beauty of Hebron, Pride of the South, Triumph, and Early Essex.

MEDIUM VARIETIES.—Early Rose, Early Puritan, and Late Beauty of Hebron.

LATE VARIETIES.—Burbank, Cannon No. 1, Peerless, Pearl of Savoy, Rural New Yorker No. 2, and Rochester.

At the South a potato is required that will continue growing through the long summer. The common sorts ripen early, and commence new growth, so that it is very difficult to keep them in their dry, mealy state. Starting the buds has the same effect upon these tubers as upon the grains of wheat which lose their starch by conversion into sugar and dextrine, making both the flour and tuber, when cooked, far less palatable and nourishing.

Potash and phosphate of magnesia are indicated by analysis to be the most important inorganic elements of the plant. Wood ashes will furnish most of the constituents required from the soil.

Culture.—The Irish potato likes a cool, moist climate and soil like those of Ireland. The soil should be well enriched with vegetable and not with animal manure.

The best potatoes in this country are grown in the cool and hilly sections of the North, and the best there are grown by simply turning over a meadow sward; upon this the rows are laid off shallow, and the clover sods are often so tough with matted roots when planting (having been newly turned over), that earth is with difficulty obtained to cover the potatoes. Soon decomposition commences, a gentle heat is given out, and by the time the potatoes are ready for the first working they can be plowed with ease. At the second working, when the plants are laid by, the soil is mellow as an ash heap, the young plant the meanwhile being supplied with moisture and the very food required to perfect its tubers and render them farinaceous and nutritive. In our gardens we cannot obtain such a soil, but we can very much improve the yield, and especially the quality of our Irish potatoes by imitating it as nearly as possible. We can dig into the soil vegetable matter to decompose, such as leaves, garden refuse of all kinds, and pine straw. Even tan bark is not a bad application to the potato crop, but if used must be accompanied with plenty of ashes or lime to correct its acidity. One reason for the application of vegetable manure to this plant is the superior quality of the tubers produced. Liebig first remarked that ammoniacal manures injure the quality of the potato, though they increase the size and quantity. If manured with strong animal manure the tubers are moist and waxy, while if grown upon a soil manured with ashes, lime, and an abundant supply of carbonaceous manures, such as decaying vegetable matter, the produce is far more starchy and nutritive. Potatoes enriched with strong dung are far more liable to rot than if manured with leaves, ashes, and lime. Cotton-seed meal is an excellent fertilizer for the potato. It produces smooth potatoes. The application is at the rate of 800 to 1,000 pounds per acre in the furrows.

The rows should be from two to two and a half feet asunder, and the sets from six to twelve inches in the row, the greater distances for the tall-growing sorts. Experiments in England have proved that there the best crops are secured when the sets are planted six inches deep, or in light sandy soil not less than seven inches. The sets should be cut a week before planting, and allowed to dry. A medium-sized tuber will make five or six sets. After the ground has been well prepared by plowing or spading, dig a trench eight inches deep, the width of the spade, and in the bottom of this form a slight furrow with a hoe, that the sets may be in a line. In this furrow the sets are placed. Cover with a good coat of manure of the kinds before directed, to which manipulated guano, or super-phosphate of lime and gypsum, may be added with advantage. The earth is hauled over them, leaving the surface some two or three inches below the general level, that the plants may receive and retain near them all the rain that falls. After the plants come up hoe them well, but do not disturb the ground if there is any apprehension of even a slight frost. When all danger of frost is over, they should, if possible, receive a good mulching of leaves directly after a good, heavy rain, and some trash may be laid over to keep the leaves in place. The leaves must not be put on too early, as when applied before the frosts are entirely over the evaporation from a bed of damp leaves so lowers the temperature at their surface that a frost scarcely perceptible elsewhere may prove fatal to tender plants thus mulched.

If the leaves are not to be obtained, keep the soil free from weeds by flat culture, until the tops cover the ground. The early crop may alternate with Lima beans, making the rows five feet apart in this case, and they will be ready for digging when the beans, which are planted in hills between the potato rows, are fit for use. This crop

should be planted as early in the spring as possible. At the South in January or February, and at the North in March or April. The main crop may be put in three or four weeks later, but the early planted crops (if they escape the spring frosts) are best. In colder climates the sets are often kept in a warm room covered with damp moss until they have grown a half inch, and then if planted out without being dried, in a warm situation, are considerably earlier. A teaspoonful of gypsum dusted over the plants when they appear above ground is very beneficial. Never work the crop after the blossom buds appear.

When the tops begin to die, dig the crop, and store in a cool, dry place. Sprinkle them with lime when dug, and they are less in danger of rot. This disease often attacks them while growing, beginning at the haulm, and descending to the tubers, which soon become a mass of rottenness. If potatoes are allowed to remain in the ground until they begin to grow, they become waxy and worthless, and those that are stored will not remain eatable, unless the sprouts are rubbed off as they appear.

Second Crop of Potatoes.—It has been the practice in the South for many years, particularly in some sections, to grow seed potatoes from the first crop, but the custom has been to look to the Northern-grown potato for the supply. It needs no demonstration to convince an intelligent gardener that the potatoes grown in the South are preferable to those shipped from a colder climate for seed purposes, and the method of securing this end by what is known as the second crop is receiving a great deal of attention among gardeners. To succeed in this cultivation the following plan must be adopted. The potatoes of the early crop must be allowed to remain in the soil until fully ripe; this can be determined by the dying of the tops. They are then dug and placed in the shade, ex-

posed to the air until greened, which will generally take two or three days. The potatoes are then bedded in single layers and covered with straw or two inches of a sandy soil without manure. If with straw the bed must be dampened and kept so until the sprouts begin to appear. They must remain in this condition until August 1st to 20th, when those which are sprouted are planted in the usual way, excepting that shallow covering is obtained and flat cultivation instead of high bedding, as is given to the early crop. This flat cultivation is to obviate the effects of the hot sun during the month of August. In well-drained soil the potatoes may be allowed to remain in the ground during the winter and dug as required, but the earth must be ridged up after the tops are dead, and the surface covered with pine straw. In August when the planting occurs the potatoes are placed in deep furrows and a thin layer of soil is put over them, and as the plants grow the earth is drawn to them until the level cultivation is secured. When this second crop is intended for table use it will be necessary to plant in July, so that the potato may mature by the time of first frost. It is not necessary to cut the potato, as is done with the seed of the early crop, but the entire potato is planted.

Use.—The tubers of the Irish potato, consisting chiefly of starch, and having no peculiarity of taste, approach nearer in their nature to the flour of grain than any other root. Hence the potato is almost universally liked, and can be continually used by the same individual without becoming unpalatable. It is a good supporter of respiration, and adapted for the formation of fat, but is deficient in nitrogenous or muscle-forming elements. Sustained labor cannot be performed on this diet without the addition of other food better adapted to the formation of flesh. Potatoes are boiled, baked, roasted, or fried. When long kept, the best ones are selected, boiled and mashed

before going to the table. Starch can be manufactured from potatoes, as may ardent spirits.

MARKETING.—The potato with an easily bruised skin is immature and unfit for shipping. Handle the crop carefully, so that no injury will occur to the surface, and harvest only in cloudy weather, or protect the potatoes as much as possible from the sun after digging. Pack in barrels, and only while the potato is in a cool condition.

POTATO (SWEET).—*(Ipomœa Batatas.)*

This valuable plant, first cultivated in England in 1597 by Gerard, is the potato mentioned by Shakespeare and his cotemporaries, the Irish potato being then scarcely known. "Let the sky rain potatoes," says Falstaff, alluding to this vegetable, which was at that time imported into England from Spain and the Canary Islands, and considered a great delicacy. The sweet potato is a tender perennial plant, of the convolvulaceous family, a native of China and both Indies. It has small leaves, with three to five lobes, according to the variety, with herbaceous vines which run along the ground, taking root at intervals. Its roots are long, spindle-shaped or oval, often very large, and abounding in starch and sugar. Its nutritious properties and agreeable flavor have brought it into general use in all parts of the globe, where the climate is warm enough to admit of its successful cultivation. The following are the most common varieties, and perhaps as good as any:

Barbadoes Bunch yam, Georgia yam, Hayman, Pumpkin yam, Red Brazilian, Spanish yam, Sugar yam, Tennessee yam, Yellow yam, Bush or Vineless. These varieties are quite sweet and not so dry and starchy as the following, which are more popular in Northern markets: Early Golden, Red Nansemond, Jersey, Southern Queen, Sugar (Creole).

Fig. 141—Vineless Sweet Potato.

The sugar potatoes are generally poor yielders, but are excellent table varieties. The Tennessee yam is a productive variety, with a sweet, rich, delicate flavor. It is next in quality to the Georgia yam, but is more productive. It is a late potato.

In the above list the early potatoes are Yellow yam, Vineless and Jersey. The others are late varieties.

Culture.

Sweet potatoes like a rich, sandy loam, perfectly friable, and, as indicated by analysis, abounding in potash. The soil should be well enriched. A dressing of

wood ashes would be very beneficial to this crop. Next to potash it demands a supply of the phosphates. They do well on fresh lands, if well broken up and friable. At the South, the Spanish potatoes are generally planted where they are to remain, like the Irish potato, whole or cut up into sets. But both these may, and the yams must, be propagated by slips, as they grow larger and yield more abundantly by this method.

To raise slips, select a sunny spot sheltered by fences or buildings, and lay it off in beds four feet wide, with alleys of the same width between them; slope the beds a little towards the sun, dig them well, and if not already rich, add plenty of well-decomposed manure. Do this in Georgia in February, or early in March. At the North a gentle hot-bed will be required, and it will be found very useful in every locality, in order that the slips may be ready as soon as all danger of frost is over.

Choose smooth and healthy-looking potatoes and lay them regularly over the bed an inch or two apart, and cover them about three or four inches with fine soil; rake the bed smooth, and it is done. In large operations, ten bushels of potatoes should be bedded for every acre of ground.

While the slips are sprouting prepare the ground to receive them. It should be rich, or made so with well-rotted manure, and thoroughly and deeply broken up with the plow or spade. Phosphoric acid and muriate of potash at the rate of 400 pounds per acre may be applied in the furrows. The formula recommended is 600 pounds of phosphoric acid and 200 pounds of muriate of potash. Lay off the soil just before the slips are ready in low, parallel ridges or beds, the crowns of which are three and a half feet asunder, and about six inches high, on which plant out the slips with a dibble eighteen inches apart, one plant in a place. Choose for this operation such a

day as you would for cabbage plants, or do it in the evening. The sweet potato is readily transplanted, and if holes are dug in the mellow bed, deep enough to admit the plant, and the slips, set upright therein, have the earth washed in about their roots by pouring water upon them from the open spout of a water-pot, finishing the operation by covering over with a coat of dry, mellow earth, brought up and pressed pretty closely about the slips to keep the moistened earth from baking, very few will die, even if they are set out at mid-day; but as the plants would be checked, a cloudy day, or just at night, should be selected for the operation.

This is an excellent mode of transplanting all plants, and is of great use both in the vegetable and flower garden. If the slips are not washed in as above when taken up in dry weather, it is of great advantage to grout them, as well as all other plants you wish to transplant. This is done by immersing the roots in water thickened with rich earth. It refreshes the slips, and gives them a thin coating of earth as a protection against the atmosphere. Draw the slips when about three or four inches high, by placing the left hand on the bed near the sprout to steady the root, and prevent its being pulled up with the sprout, which is loosened with the right hand, taking care not to disturb the fibrous roots of the mother potato, for this continues to afford a succession of slips, which may be successfully transplanted in Georgia until the first of July. At the North they should not be put in later than the first of June.

After the piece is planted, go over it again in a few days to plant over any place where the slips may have failed. As soon as the ground gets a little weedy, scrape it over, loosening the earth and covering up the weeds, but be careful not to injure the young slips. Faithful cultivation and a frequent moving of the soil are as beneficial to this

crop, while young, as to any other. At one of the hoeings just before being laid by, the ground should be deeply moved with the plow or spade, but not close to the plants. They should be laid by before the plants run a great deal, after which they should be undisturbed. Be careful not to cover the vines, but if they become attached to the soil, loosen them up from it, so that the vigor of the plants may be thrown into the roots and not into the running vines. Make the hills large and broad, not pointed. In hoeing, draw the vines carefully over towards you while you draw up the earth and cover the weeds; then lay them carefully back, and finish the other side in the same manner. At this time fill the spaces between the rows with leaves and litter while the ground is wet, to retain the moisture. After the vines have covered the ground too much to use the hoe, any large weeds that appear should be pulled up by hand.

The Yam potato can also be raised from seed, but the Spanish variety, like the sugar cane and many other plants long propagated by division, rarely produces seed.

Just as soon as the tops are killed by frost, the potatoes should be gathered. In field crops they can be plowed up and gathered by hands which follow the plow, depositing the potatoes in small heaps, but in the garden the potato can be gathered with the hoe or the potato hook, an implement much used in gathering crops of the Irish potato. It is better to do this in a dry day, and many prefer to dig their potatoes just before the frost kills the vines, thinking they keep better.

To keep sweet potatoes it is necessary, at the North, to store them in a dry, warm place, in well-dried sand. At the South they are safely stored in hills containing thirty or forty bushels each. Let the potatoes, when dug, dry in the sun through the day. In digging and handling they should not be bruised. Elevate the bottom of

the intended pile about six inches with earth, furnished by digging around it a circular trench. On this put pine straw two or three inches thick, or dry leaves, on which place the potatoes piled in a regular cone. If the weather is good, cover them only with pine or other straw for two or three days, until the potatoes are well dried, before their final earthing up. Let the covering of straw be three or four inches thick; then cover it over with large strips of pine bark, commencing at the base, and cover as shingling unto the top, leaving a small aperture. Cover four or five inches thick with earth over all, except this aperture, which must be left open for the escape of the heat and moisture generated within. (*Peabody.*)

Some cover this opening with a piece of pine bark, to keep out the rain, but a board shelter is preferable. It is well to protect the hills from rain by a temporary roof of plank. When the weather gets warm, in the spring, take up the potatoes, rub off the sprouts, and keep on a dry floor. If put up with care they will keep until July. One important step toward their certain preservation is to gather them carefully from the ground, as the least bruise produces rapid decay.

For Seed.—Some of the finest roots of the most productive hills can be packed in barrels and covered with sand in a dry, warm place, free from all exposure to frost. A small garden crop is best kept in barrels with dry sand or leaves; if the latter, a layer of leaves at the bottom, then a layer of potatoes, then a layer of leaves, and so on until the cask is filled. Use dry leaves and store in a dry place.

Use.—This root is deservedly a favorite at the table, and the most wholesome grown. In nutritious properties it excels all other roots cultivated in this country, except the carrot. Weight for weight, it contains more than double the quantity of starch, sugar and other elements of nutrition that are found in the best varieties of Irish

potato. For feeding stock three bushels are equal to one of Indian corn, yielding, on the same land, five or six times the food that is produced by this most profitable grain.

A good-baked sweet potato is almost as nutritive as bread. They are better baked than boiled. They are also used for pies and puddings, and sweet potato rolls are excellent. In short, the modes of cooking this valuable vegetable are innumerable, but perhaps the very best is Marion's mode of roasting in the hot ashes.

MARKETING.—The same system adopted in placing the Irish potato on the market. In the case of the sweet potato it is not so necessary to protect against the sun, and such great care in handling is not required as in the case of the Irish potato.

PUMPKIN.—(*Cucurbita Pepo.*)

A trailing annual, from India and the Levant, with globular or cylindrical fruit. It has become so crossed that it is difficult to say of some varieties to which species they should be referred.

The best variety for family use is the Cashaw, a long, cylindrical, curved variety, swollen at one extremity, of fine, creamy yellow color, very solid and excellent to use as a winter squash, and quite as valuable as any for the other purposes. Pumpkins are not as particular about soil as melons and cucumbers, but will grow well on any tolerably rich ground. It is not best to grow them in the garden, as they will mix and corrupt the seed of the other varieties. They like a soil freshly reclaimed from the woods; the field is the proper place for their cultivation. Plant when the main crop of corn is put in; let the hills be ten feet apart. Hoe frequently and keep clean. Let only one plant remain in each hill. Do not earth up the plants, but keep the soil about them light

and loose with the hoe, until the vines prevent further culture.

Use.—In France, as well as in New England, the pumpkin is much used for stews and soups. The best, such as Cashaw, are good substitutes for the winter squash, and make an excellent pie. They are also a valuable food for cattle. They can be preserved by boiling and drying the pulp in an oven, or by cutting in strips and drying by the fire, or will keep very well whole, if in a cool, dry place, free from frost.

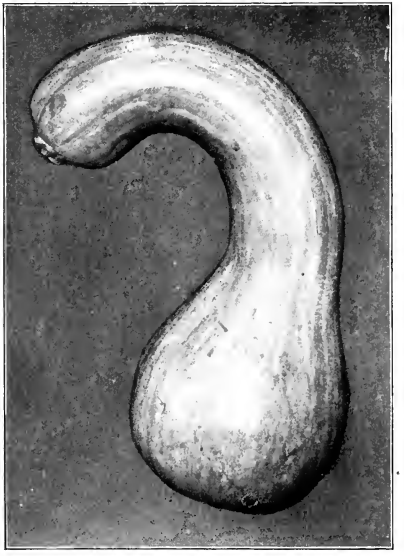
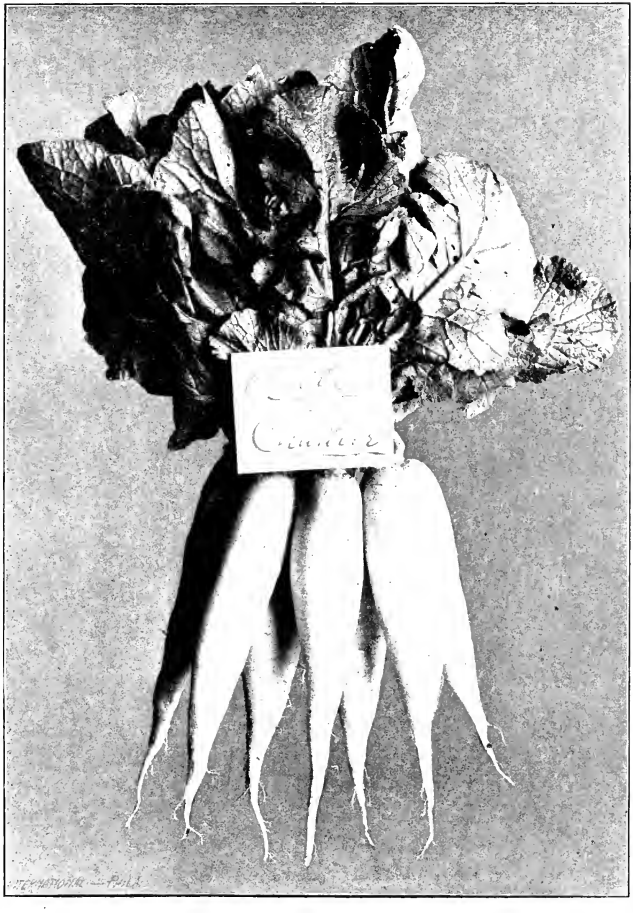


Fig. 142—Mammoth Golden Cashaw.

RADISH.

(Raphanus sativus.)

This is an annual Cruciferous plant, grown in England as early as 1548, being one of the plants mentioned by Gerard. The lower leaves are lyrate; stem about two feet high, with pale violet flowers; the root fleshy, spindle or globular-shaped; of various colors. There are two kinds of radish, the spindle-rooted and the globular or turnip-rooted. These are again divided into early and late varieties, among which we will notice:



(409) Plate 5 – New White Chartier Radish.

Early or Spring Radishes.

EARLY SCARLET SHORT-TOP.—Root long and spindle-shaped; leaves very short. It is the earliest, most crisp and mild-flavored, and requires less space than the other varieties. Much esteemed for its bright color. The root grows partly above ground. Long Scarlet Early Frame and Salmon differ very slightly from this.

WHITE TURNIP-ROOTED has a white exterior and a round bulb, terminating in a small, fibrous root. Flesh white and mild.

YELLOW SUMMER.—This is a turnip-rooted variety, named from its color, and will stand the heat better than any other variety.

Winter Radishes.

BLACK WINTER OR SPANISH.—Turnip-shaped, black, and very large; sown in August or September with turnips. It can be gathered and stored for winter. The flesh is white, hard, and hot. The White Spanish is white outside, and the flesh milder than the Black.

CHINESE ROSE-COLORED WINTER.—Conical; bright rose-colored; flesh solid; texture fine; rather hot.

FRENCH BREAKFAST.—A rapid grower; mild, tender and crisp; an excellent variety for forcing. The upper portion is red and the lower part is white.

Autumn Radishes.

ROSE-COLORED CHINESE.—The flesh is white and the skin red. Flavor very good.

CHARTIER.—Long, scarlet and white-tipped.

Culture.—Radishes like a rich, sandy loam, dug a full spade deep, but succeed in any good garden soil. Their culture is very simple. If manure be freshly applied, it should be at the bottom of the soil, or the roots will fork. They are often sown in beds four or five feet wide, thinly

broadcast; but it is better to put them in drills about eight or ten inches apart, an inch deep, scattering the seed thinly, which may be in beds devoted to this crop, or made between the wider rows of beets, parsnips, onions, carrots, as well as spinach, peas, beans and Irish potatoes. Thus sown, they will yield large crops, without taking up room available for other purposes.

From the first of November until March a succession of the Oval Rose, or Scarlet Short-Top varieties, can be grown under glass. All that is required is a bed of good, rich loam, watering them occasionally, and giving air every day, except when the temperature is below freezing point. Let the sash be off in every mild rain, and let the earth come within

Fig. 143—China Rose Winter Radish.

seven or eight inches of the glass. On open ground crops can be made for fall use, if desired, by sowing in succession, after the summer heats are over, until about the time of the first frosts. With the first opening of spring, commence planting in the open ground, and sow every week or two until the dry, hot weather comes on. In the low country South, they may be grown all winter, with no other protection than a little litter thrown over the beds in severe frosts. As birds are very fond of the seed, it is sometimes necessary to protect the beds with nets. Radishes are of such rapid growth, that they will generally take care of themselves after planting in a good soil, but hoeing once will hasten their growth.

For Seed.—Some of the finest and earliest can remain where grown, or be removed to another bed and inserted up to their leaves. Water frequently until established, and while the flowers are opening. Let the roots be three feet apart, and do not permit any others to flower near them, if pure seeds are desired. When the pods turn dry, gather, dry, thresh out, and save in paper bags. The seed will keep three years.

Use.—The tops used to be boiled for greens. The seed leaves, when they first appear, are used as a salad, with cress and mustard, and the seed-pods, gathered young, form a good pickle, and are a substitute for capers.

There is a species, *Raphanus caudatus*, or Rat-tailed radish, of which the pod grows a foot or more in length, with a peculiar pungent but delicate flavor, and it may be eaten like the root, or pickled. It is from Java.

Of the common species, however, the roots are the parts mainly used. They are much relished, while young and crisp, for the breakfast table. They contain little beside water, woody fiber, and acrid matter, so they cannot be very nourishing or wholesome. When young, and of

good varieties, they are much more digestible than when older and more fibrous.

MARKETING.—Tie in bundles after washing. The string is placed on the bundle about three inches from the point where the tops leave the root. This will make the vegetable lie flat in the package. The shipment is made in crates, or in ventilated barrels.

RAPE, OR COLZA.—*(Brassica Napus, var. oleracea.)*

Rape, or Colza, is a biennial plant of the cabbage tribe, a native of England, with glaucous radical leaves and yellow flowers, appearing early in spring. It is often called kale.

Culture.—Sow at the same time with cresses and mustard in late winter and spring. Sow in drills or beds, and follow the culture directed for white mustard. Rape, sown like turnips the first of September, will survive the frosts and afford an abundance of fine greens the latter part of winter and early in spring, wherever the turnip will stand the winter.

Seed.—A few plants sown in August and September, and kept over, will flower and seed the next year abundantly.

Use.—The seed leaves are gathered young for a small salad with cresses and mustard. Later it is used like mustard for greens. This plant is much cultivated in Europe for the oil expressed from its seeds.

RAPE, EDIBLE-ROOTED, OR FRENCH TURNIP (*B. Napus, var. esculenta*) is another variety with edible roots, sometimes cultivated as a substitute for the turnip. The root is white, carrot-shaped, about the size of the middle finger. It is much grown in Germany and France. This is not the French turnip of the North, but is the Teltow of the Germans.

Culture.—It is raised from seed, which may be sown in August or September, and requires the same treatment as turnip. It likes a sandy soil, and if grown in too rich earth, it loses its sweetness. In dry weather, the beds must be watered regularly until the plants get three or four leaves. To save seed see *Turnip.*

Use.—It is much used in continental cookery, and enriches all the French soups. Stewed in gravy, it forms an excellent dish, and, being white and carrot-shaped when mixed with carrots upon a dish, it is very ornamental. In using, there will be no necessity of cutting away the outer rind, in which the flavor chiefly resides. Scraping will be quite sufficient.

RHUBARB.—*(Rheum.)*

The garden Rhubarb, or Pie-plant, is a perennial, of the same natural family as the common dock. The varieties now cultivated are hybrids, which have supplanted the original species, *Rheum Rhaponticum*, *palmatum*, and *undulatum*, excelling them in size, earliness, and delicacy of flavor. The best sorts are the Early, which is of but medium size; Myatt's Linnaeus, rather early, and yielding large crops of large leaves, and the best flavored of all, Myatt's Victoria, which is two weeks later; stalks very large and good; St. Martin's, a new Scotch variety, with a rich, spicy flavor.

Rhubarb is remarkable for the quantity of phosphates and soda it extracts from the earth. Crude soda might be added to the soil. Guano and bone-dust are very beneficial.

Rhubarb succeeds best in a rich, deep, rather light loam, and in a situation open to the air and light. Trench the ground two spades deep. It may be raised from seed, but thus grown, sports into new varieties. It is best propagated by dividing the roots, reserving a bud to each

piece. These may be set about two inches deep in rows three feet apart, and from eighteen to thirty inches (according to the sort) in the row. All the culture required is to keep the surface soil light and free from weeds. The plantation may be made in the fall, after the leaves are killed by frost, and protected by litter, or as early in the spring as the weather and soil permit. It should not be disturbed after growth commences. Pluck no leaves the first year, after which the crop will be abundant. Make a new plantation about once in five years. If a plant or two in summer dies out, as it is apt to do in the South, it is best to remove, the next autumn, the old plant, together with soil in which it grew, and supply fresh soil. New plants to reset the vacancy can be obtained by uncovering an old crown and cutting from it a bud with a piece of root attached.

To obtain the largest product, the flower stems should be broken off when they appear, for the plant is weakened by permitting it to seed. A yearly surface dressing of well-rotted manure should be given, for the stalks to be good must be quickly grown.

Forcing.—This plant is forced by placing a large flower pot over the roots, and covering with stable manure. The more common way is to surround the plant with a small barrel without a head; a cover is placed over it at night and in cold days, and it is then surrounded with a pile of stable manure built up in as sharp a cone as it can be made to form. If the root is good it will soon fill the barrel with shoots. The plant should be permitted to rest after this crop through the season, and others be selected for the purpose the next year. This operation, at the North, is common enough, but at the South it is generally death to the plant.

Use.—The leaf-stem, or petiole of this plant, when the external skin is removed, is cut up in thin slices, and,

having an agreeable acid, is used exactly like the apple for pies, tarts, and sauce at a time that fruits cannot be obtained. Gather them while young, just as they attain their full size, before they lose their fine flavor. They should be gently slipped from the root without using a knife.

This plant is in almost universal use in England, France, and the Northern States, and succeeds perfectly well in Middle Georgia.

SALSIFY.—(*Tragopogon porrifolium.*)

Salsify, or Vegetable Oyster, is a hardy, tap-rooted biennial, a native of various parts of Europe, with long tapering root of a fleshy, white substance, the herbage smooth and glaucous, the flower-stem three or four feet high, and the flower of a dull purple color. It belongs to the Composite family.

MAMMOTH SANDWICH ISLAND is the variety generally cultivated in the South. It grows vigorously to double the size of the older forms, and yields an excellent flavor. The *Long White* is the old standard salsify.

Salsify likes a light, mellow soil, dug very deeply, as for carrots and other tap-rooted plants. Sow early in spring, and for a succession until the summer heats come on, rather thickly, in drills an inch deep and a foot apart. An ounce of seed will sow a square rod. Scarlet radish may also be sown thinly in the same drills. When an inch high, thin the plants, and continue by degrees until the plants are six inches apart. If the soil is deep and moist, they will grow all summer and not run up to seed. Watering in dry weather, especially with guano water, will greatly invigorate the plants. Cultivate the soil, and keep it free from weeds, as for beets and carrots. The roots may be drawn and stored in sand, but where

the winters are open should remain in the ground all winter, to be pulled as wanted.

For Seed.—Leave or transplant some of the best plants in spring, which will produce seed abundantly. Gather and dry in the heads, where they may be kept until wanted.

Use.—The stalks of old plants are sometimes cut in the spring as a substitute for asparagus. The roots are boiled or stewed like carrots, and have a mild, sweet flavor, being wholesome, palatable, and tolerably nutritive. They are mostly cooked to imitate oysters, to which the flavor has some resemblance.

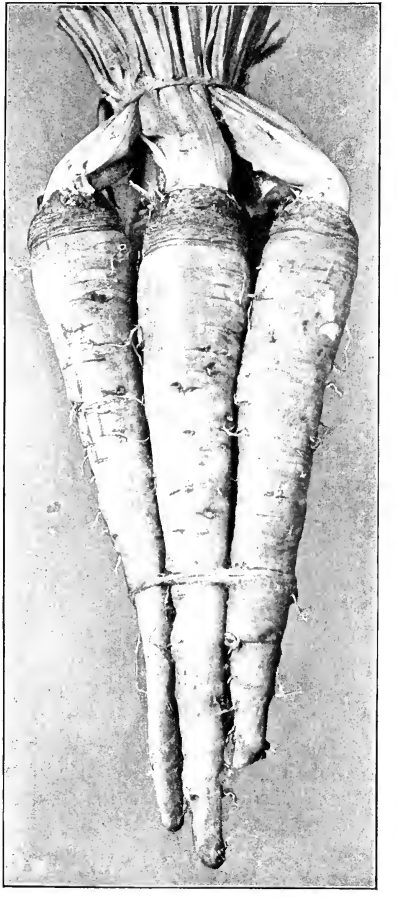


Fig. 144—Sandwich Island Salsify.

MARKETING.

After washing, six or eight roots

are tied together in each bundle by a cord around the short tops left on, and another at the lower end of roots. Ship in crates.

SAVORY.—*(Satureja.)*

This is a genus of Labiate plants of which there are two species in cultivation—the Summer Savory (*Satureja hortensis*), a hardy annual; and Winter Savory (*Satureja montana*), a shrubby perennial; both natives of Italy, and cultivated for their warm, aromatic flavors.

Both may be propagated by seed. Sow in spring, as soon as the ground is a little warm, moderately thick, in shallow drills, and cover lightly. For Summer Savory the rows should be twelve inches apart, and the plants thinned to six inches; the thinnings may be transplanted to the same distance. Winter Savory requires more room; the plants should be a foot apart, in drills fifteen inches asunder. This can be propagated also, by slips, cuttings, or division of the roots. All the care required is to keep free from weeds. Seed can be gathered as it ripens from a root or two left uncut for the purpose.

Use.—The leaves of these herbs are much employed in soups, salads, stuffings, etc., on account of their agreeable pungent flavor. They are also said to possess the desirable power of "expelling fleas from a bed." Formerly, they were much used in medicine. Gather when they come into bloom, and dry for winter use in the shade, pound in a mortar, pass through a sieve, and put up in bottles closely stopped, and they will retain their fragrance any length of time.

SEA KALE.—*(Crambe maratima.)*

This is a hardy Cruciferous perennial, a native of the dry, shingly shores of Great Britain. The plant is smooth, of a beautiful glaucous hue, covered with a fine meal, and with large, sinuated radical leaves. The flower is of a rich

white appearance, and a honeyed smell. It has probably been cultivated in gardens one hundred and fifty years, but not very generally until the beginning of the present century, though the English peasantry from time immemorial have been in the habit of gathering the blanched shoots as they pushed through the sand, and boiling them as greens. Though a native of a cool climate, it succeeds perfectly in Middle Georgia.

The following represent the varieties proven to be suitable for the South: Early Curled Siberian or Dwarf German Greens, Dwarf Green Curled Scotch or Norfolk.

Fig. 145—Sea Kale.

Culture.—The native soil of sea kale is a deep sand, mingled with matter from the sea. It likes a deep mould, or sandy loam, and if poor, well-putrified dung and half-decayed leaves may be added. Upon the richness and proper preparation of the soil the luxuriance of the plant depends. The situation must be free from all shade of trees. Sea kale is propagated by seeds, or offsets, or cuttings of the root; but the best plants are raised from seed. Sow the seed in a well-prepared soil, rich, or made so with well-decomposed manure, and shaded by a fence, or building, from the midday sun. Draw the drills one foot apart, and scatter the seed thinly along the drills. The beds should be about four feet wide, for convenience.

Sow very early in spring. If the outer coat of the seed be bruised, without injuring the inside, the germination will be accelerated. The plants are very slow in appearing; never less than three weeks, often four or five months, and sometimes a full year. Water plentifully in dry weather, and keep the seed-beds free from weeds during the season. Thin the plants as they appear to an inch apart, and, as they grow strong, to two or three inches, and keep free from weeds. In the autumn, when their leaves decay, clear them away, and earth them up about the crowns with an inch or two of soil from the alleys, or leaf-mould from the woods, and cover over the whole bed, four inches deep with long litter, and leave it to stand until the time of transplanting.

As early as possible the spring ensuing, prepare the permanent bed for those you wish to transplant. Those raised where they are to remain succeed best.

Let the soil be light, and well enriched with good compost. Leaf manure is better than hot dung. Dig it up deeply and thoroughly at least two feet deep, and lay it off in beds three feet wide, with alleys two feet in width between. Upon each of these beds plant two rows of plants eighteen inches apart, and the same distance in the row. Take up the plants very carefully with the trowel, so as not to disturb the roots. If you plant cuttings of old plants put two in each place, to guard against failures. In all cases, be careful in transplanting that the roots are not broken or dried by exposure to the sun and air. During the dry, hot weather of summer, the beds should be liberally watered the first season after replanting, as upon their summer growth depends the next season's crop. Keep the soil clean, and after the plants get well rooted dig over the ground between the rows, making the soil as fine as possible.

The coming autumn the earthing-up must be a little

increased; give a coat of leaf-mould, or compost manure, and over this a thick coat of leaves, which will bring the plants on early in the spring. The next spring remove the litter, and dig in some of the manure into the alleys, and then, if you blanch with pots, spread over the beds about an inch deep of clean sand. The shoots may be blanched, and a few cut for use, but sparingly, as the plants must not be weakened. The better way is not to remove the covering of leaves until you have gathered what you desire. On a portion of the bed, to produce early, the winter covering of compost and leaves must be yearly applied.

Another portion must be left uncovered until the shoots begin to rise, and then covered with eight or ten inches of sand, for a later crop. Each spring give it a dressing of salt, like asparagus, and dig over the surface of the bed, as before. Retain for each plant only four or five of the best suckers, at regular distances around the stem; suffer none of these to seed, if you would not greatly injure the next year's growth.

Sea kale, though eatable without blanching, as spring greens, is vastly improved when blanched. This may be done by earthing-up the crowns eight or ten inches with sand, or light mould, or by retaining the coat of dry leaves put over the beds in autumn.

This covering may remain until the cutting ceases in the spring, when all covering must be removed at evening, or in cloudy weather. The shoots will raise the covering when in a fit state for cutting. The courses of leaves should be from five to twelve inches thick, according to the age of the plants, and as directed above, may remain on all winter. But a large flower pot, with the hole in the bottom stopped, and light at the edges carefully excluded by a coat of litter is the best of all modes of blanching.

For Seed.—A plant that has not been blanched or cut from must be allowed to run to seed in the spring. A single plant will produce an abundant supply.

Use.—Sea kale comes on early in March, when vegetables are scarce, and affords a very wholesome and agreeable table luxury. The young shoots and leaf stalks, before unfolding, are boiled and dressed like asparagus, are employed in soups, and also make an agreeable salad.

SHALLOT, OR ESCHALLOT.—(*Allium Ascolonicum.*)

This is a plant of the onion tribe, which derives its botanical name from growing wild at Ascalon, in Syria. It has a strong taste, but as the strong flavor is not offensive, like the garlic, and does not remain so long upon the palate as the onion, it is often preferred. The root is bulbous, similar to that of garlic in being divided into cloves, included in a membrane. It rarely sends up a flower-stock, and hence is often called the barren onion.

The best sorts are the Common and the Long-Keeping, of which last the bulbs have been kept two years. The "Big Shallot" of our gardens is Rocambole.

Culture.—It is propagated from the offsets of the roots. Prepare the beds as for the rest of the onion tribe, but it will do with not quite as rich a soil. Let the soil be made perfectly light and friable. The last of September is the best time for planting the early crop, but they may be planted any time during the autumn and winter. The early planted ones come into use early in May. Make the beds four feet wide, and mark them off in drills an inch deep, ten or twelve inches distant, and put the offsets out six inches apart in the drills. Do not cover deeply; leave the point of the clove just even with the surface of the earth, and press the soil around. Keep the ground free from weeds, but be particular, in hoeing, not to earth up the bulbs. The leek is the only member of the onion

tribe that is not injured by gathering the earth about its stem. Take up the bulbs when ripe, dry in the shade, and preserve as garlic. They may be kept until the next spring.

Use.—The shallot, though more pungent than some members of the onion family, is preferred by many in seasoning gravies, soups, sauces, and other culinary preparations, and is by some considered almost indispensable in the preparation of a good beefsteak. It can be pickled in the same manner as the onion.

SKIRRET.—*(Sium sisarum.)*

Skirret is a perennial Umbelliferous plant from China, known in Europe since 1548. It grows a foot high, with pinnate lower leaves. The root is composed of several fleshy tubers, the size of the little finger, joined at the crown.

Culture.—Skirret likes a deep, rich, rather moist soil, with the manure applied at the bottom. The situation should be open. It is propagated by seeds, or by offsets of established roots. Seedlings produce the best roots. Sow in spring, when the ground becomes warm, in drills an inch deep and ten inches apart. When the plants are an inch or two high, thin to six or eight inches apart. Cultivate like salsify, and keep clear from weeds. They will be fit for use in August, but can remain in the ground to use as wanted all winter. Slips of the old roots may be set out nine inches apart and cultivated in the same manner. Leave some of the plants in the ground, and they will throw up seed-stalks and ripen seed during the summer following.

Use.—The tubers are boiled and are very sweet, somewhat like the parsnip, and are thought more palatable by some, but are disagreeable to many. They are boiled, and served up with butter, or cold, with vinegar and oil,

and are also cooked, like salsify, in batter. It was formerly esteemed as "the sweetest, whitest, and most pleasant of roots."

SORREL.—*(Rumex.)*

The sorrels are perennial plants belonging to the same family as dock and rhubarb. There are three species cultivated—viz.: *Rumex acetosa*, or common English garden sorrel, of which the Belleville variety is best; *R. scutatus*, French or Round-Leaved Sorrel, a trailing plant, with more acid leaves than the last; *R. montanus*, Mountain Sorrel, like the last, a native of France. Of this last there are two varieties—the Common Mountain and the Green Mountain Sorrel. The first has pale green, blistered leaves, less acid than the common English, and does not run quickly to flower. The Green Mountain Sorrel is earlier than this, and is the latest to flower, producing freely dark-green leaves of considerable acidity. The flowers of the first and last species are dioecious.

Sorrel will grow from seed, or dividing the roots early in spring. Sow in drills fifteen inches apart and as they come up, thin them to one foot in the row; or part the roots in the autumn or spring, and set them out at the same distance. Water them occasionally until well established. Keep the plants free from weeds; cut down the stalks occasionally in the summer, and cover the crowns with a very little fresh earth, that they may send up large and tender leaves. When, in two or three years, the plants begin to dwindle, replant them in fresh soil. For seed, let some of the stalks run up, and gather when ripe.

Use.—Sorrel is much used by the French in soups, sauces and salads, and is also cooked as spinach, a method which many think improves its flavor, especially if cooked with turnip tops. Some use the leaves in pies as a substitute for rhubarb.

SPINACH.—*(Spinacia oleracea.)*

Spinach is a hardy annual of the same family with the beet (*Chenopodiaceæ*), and has been cultivated in English gardens since 1568, and probably long before. Some refer its origin to Western Asia. The leaves are large, stems hollow, and the male and female flowers produced on different plants. Its name, *Spinacea*, is derived from the Latin, *spina*, a thorn, on account of the prickly seed of one variety.

There are four sorts, three of which are smooth seeded, and the other prickly.

Round-Leaved has large, roundish, and fleshy leaves, and is the sort commonly used for spring and summer crops. Late in the season it soon runs to seed.

Lettuce-Leaved.—Leaves rounder than the last; fleshy, or thick, and of a dark-green color; nearly or quite as hardy as the last.

Prickly-Seeded, or Winter Spinach.—Leaves smaller and thinner than the other sorts, triangular-shaped, and very hardy.

Henderson's Savoy-Leaved or Bloomsdale is a variety producing leaves very much folded and bloated. For this reason it stands shipping well. It is one of the earliest varieties grown.

Long Standing is a good fall and spring variety; has thick leaves; prostrate.

Culture.—For the winter crop, a light, dry, but fertile soil is preferable; while for spring sowings, to have them long in use, a rich, moist loam is desirable. The lime and salt mixture with superphosphate of lime will supply most of the inorganic elements required by spinach. Give them an open situation. The earth should be well pulverized before sowing, as fine tilth greatly promotes vigor-

ous growth. Spinach is propagated from seed so easily, and is so valuable for winter greens, that no garden should be without it.

The first crop is sown at the South the first of October, and in succession until winter sets in, and on the coast through the winter months the sowings are continued. At New York the first of September is the proper season. For this crop the prickly is the hardiest, but the Lettuce-Leaved is the best. Another sowing should be made as soon as spring opens, and they may be continued until the summer heats come on, when the plants will quickly run to seed. Use the smooth-seeded kinds for the later crops.

Sow thinly in drills an inch deep, about fifteen inches apart, or eighteen inches for the larger varieties. Sow in moist weather, or if dry, water the seed in the drill before covering, for if moisture be wanting during the early stages of vegetation, not half the seed will come up. Thin them by degrees, separating them at first only an inch or two as the plants grow fit for use. Thinning should commence when they attain four leaves an inch or so in breadth. The plants must finally stand in the drill, for the prickly spinach five inches, and the round leaf eight inches. Keep the rows frequently hoed and free from weeds. Hoe in dry weather. Spinach kept clean and thinned properly is not so liable to die out in winter. During severe weather a thin covering of straw or evergreen brush is essential for the protection of the winter crop north of Washington, and is very beneficial south of that point. Regular gathering greatly promotes the health of the plants. The outer leaves only should be used, leaving the centre uninjured to supply successive crops. At the end of the winter, the soil between the rows of the winter-standing crop should be gently stirred, to assist their production in early spring. For summer

spinach and all other plants cultivated for their leaves, the soil cannot be too rich.

For Seed.—Some of the latest plants of the standing crop should be allowed to run up to seed; let these plants be eight or ten inches apart. Spinach is dioecious, and the male plants may be removed when the seed begins to form. When ripe, pull the plants, dry thoroughly on a cloth, and beat out and store the seed in paper bags. Spinach seed will keep three years.

Use.—Spinach and German Greens are the best plants to raise for a supply of early spring greens. Spinach eaten freely is laxative and cooling; it is not very nutritive, but very wholesome. It is so innocent that it is permitted to be eaten in diseases where most vegetables are proscribed. The leaves are very tender and succulent, and of a most beautiful green when boiled. The juice is often used for coloring various culinary preparations.

SPINACH, NEW ZEALAND.—(*Tetragonia expansa.*)

An annual plant brought by Sir Joseph Banks from New Zealand in 1772, with thick, succulent, pale green, procumbent, deltoid leaves, and with small, green, inconspicuous flowers. It grows four or five feet high, and is of the same natural family as the ice plant.

Culture.—New Zealand Spinach may be sown early in April. The best soil is loam, deeply dug, and enriched by a liberal supply of manure. Make the drills three feet apart, and scatter the seed about six inches apart in the drill, and cover them an inch deep. Thin out the plants to twenty inches apart. Keep the ground thoroughly tilled and free from weeds, that the plants may make a luxuriant growth. In five or six weeks the young leaves will be ready to be picked. Preserve the leading shoot, and the branches will continue long in bearing, as in autumn they survive a pretty heavy frost. Twenty

plants are enough for a family. Seed may be gathered as it ripens, dried carefully in the shade, and put up in paper bags.

It is used as a substitute in summer for the common spinach. Swiss Chard is a better one. The seed vessels make a good pickle.

SQUASH.—*(Cucurbita Melopepo.)*

The squash is a tender trailing annual, and was first brought to England in 1597. It is a native of the Levant. It is a much esteemed garden vegetable, and in some of its varieties can be had for the table the greater part of the year.

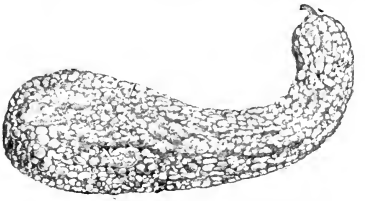


Fig. 146—Mammoth Summer Crookneck.

SUMMER SQUASHES. The best are the Early Bush Scollop, which is small, and either white or golden yellow in its two subvarieties; both good; the Summer Crookneck, also a bush variety, bright yellow, covered with warts; Bergen, small, bell-shaped, striped dark green and white; used green, like the preceding, and when the shell hardens, becomes still better, being very dry and rich, and keeps well.

WINTER SQUASHES are of many varieties; as Valparaiso or Cocoanut, as it is named from its shape. It has a rough, grayish coat, flesh deep orange, very dry, and sugary. It is the best of all, but a great runner, and bears but moderately. Boston Marrow, Bell, Canada Crookneck, Hubbard, and Perfect Gem are all good winter sorts. The Hubbard is a variety of great excellence, related to the Valparaiso. The Cashaw Pumpkin is a good substitute for the winter squash.

VEGETABLE MARROW SQUASHES are in England the favorite sort, and used from the time the blossom drops until matured. The Custard Vegetable Marrow is now

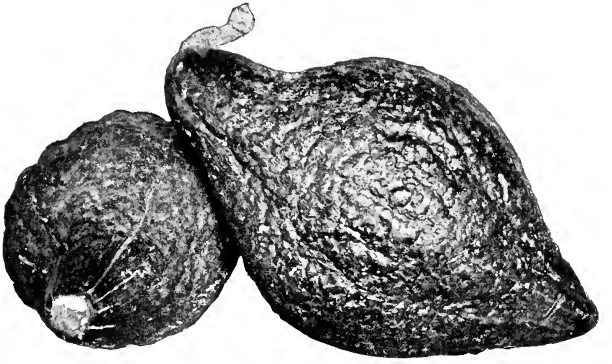


Fig. 147—New Red Hubbard Squash.

the kind preferred there. From a single trial they do not appear productive.

Culture.—The squash is planted at the same time as the cucumber and melon. Put six or eight seeds in a hill, and thin out to two or three when they get up. The bush squashes should be five feet apart, and the winter varieties at least ten. For cultivation, see *Cucumber*. Squashes are much better grown in rich soil; do not plant them near the cucumber or melon, if you would not have worthless seed from all the plants in their vicinity. Gather summer kinds while the finger nail can easily penetrate the rind; they must be plucked as soon as fit for use, or the fruitfulness of the vines will be much

Fig. 148—Boston Marrow.

impaired. To keep winter squashes they must be put away in a cool, dry place, free from frost.

Use.—The squash is a very wholesome and tolerably nutritious vegetable, prepared for the table in the same manner as the turnip, for which it is an excellent substitute to eat with fresh meat. To be fit for use after being boiled tender, the summer sorts must be squeezed between two plates, for when full of water, as often served, it is not fit to be eaten. The winter squashes should be boiled dry. They make a good pie, like the pumpkin and the sweet potato.

MARKETING.—Shipped in barrels or crates. The home market should be cultivated, because it is difficult to compete with Northern gardeners since his squash can be stored through the winter for the early spring trade.

TANYAH.—(*Calocasia esculenta.*)

This is a large-leaved, tuberous rooted, perennial plant of the Arum family, much cultivated in the Sandwich Islands, and forms the principal ingredient in the favorite *poi*, a food much in use there, and remarkable for its fattening properties.

It is cultivated somewhat near Charleston, and along the coast, and is perfectly hardy here, and probably near the coast as far north as Washington. The foliage is quite striking.

Culture.—It may be planted in any rich, well-drained, low spot. Select the eyes or buds, and plant like the potato. The small roots are the ones generally reserved for this purpose. There are two distinct kinds, named from their color the pink and the blue, of which the latter is thought by many to be the most farinaceous, but others prefer the taste of the pink variety. The sets may be put out in March or early in April, and the most attention required is to keep the soil clean and mellow. The rows

may be three or four feet apart, and the plants two feet in the rows. It comes to maturity the autumn after planting, and may remain in the bed until wanted. It keeps better than either the sweet or Irish potato. It is prepared for the table by simply roasting, and is eaten with salt. By many they are much liked, as they are quite farinaceous.

TARRAGON.—*(Artemisia Dracunculus.)*

This is a perennial plant, of the same genus as the wormwood, but its fragrant smell and warm aromatic taste have introduced it into the kitchen garden.

Culture.—This plant does not require a rich soil, and as it is a native of a cold climate, it is best to give it a bleak winter exposure. Poor, dry earth is necessary to perfect its flavor. Tarragon is propagated by seed, slips, cuttings and parting of the root. The latter is the easiest mode and most generally practiced. It may be planted in early spring, the plants being ten inches apart. Give a little water in dry weather until they are rooted. As they run up, if seed is not desired, cut down the seed stalks and they will shoot up afresh. Keep them free from weeds. It has been cultivated here with success. It must be taken up, divided, and reset every year, or it will die out.

Use.—Tarragon is used in salads, to correct the coldness of other herbs. Its leaves are excellent pickled, or for flavoring vinegar to be used for fish sauces, or with horse-radish for beefsteaks.

THYME.—*(Thymus.)*

Common Thyme (*Thymus vulgaris*) is a low, evergreen undershrub, a native of Spain, Italy, and Greece, cultivated in English gardens since 1548, and probably earlier. Its name (*Thymus*) comes from the Greek word for cour-

age; as it was thought to renew the strength and spirits. It has a pleasant, aromatic smell, and a warm, pungent taste. There are two varieties—the broad and narrow leaved.

LEMON THYME is also a low, trailing evergreen shrub, seldom rising above four or six inches high. It has a strong smell of lemons, which gives it its common name, and is preferred for some dishes.

Culture.—Thyme is raised by seed, cuttings, and dividing the roots. A light, dry soil is suitable. The root slips may be set out in rows six inches apart each way. The seeds are very small, and should be sown in moist weather in spring, the soil for their reception made very fine, and the seed raked in lightly with the back of the rake. Press the surface gently with a board or the back of a spade. Make the drills six inches apart and very shallow. Water lightly in hot, dry weather, both before and after the plants are up. Let them remain in the drills or transplant when two or three inches high. Thin the plants to six inches apart, and keep free from weeds while the plants are small.

Thyme is often used as an edging. A very small plot is enough for any family.

For Seed.—It bears seed abundantly, if permitted. The spikes should be gathered as the plant ripens, before it is washed out by the rain. Dry upon a cloth in the shade.

Use.—The young leaves and tops are used in soups, stuffings, and sauces. They can be dried and preserved like other herbs; but in mild climates this is unnecessary, as it is evergreen.

TOMATO.—(*Lycopersicum esculentum.*)

The Tomato is a tender annual, a native of South America, and some say of Mexico, and of the same natural family with the eggplant and Irish potato. It

was introduced into England in 1596, and was long cultivated in the flower garden for its beautiful red and yellow fruit, which was not used for food, but by many considered poisonous. "As an esculent plant, in 1828-'9," says Buist, speaking of its use in this country, "it was

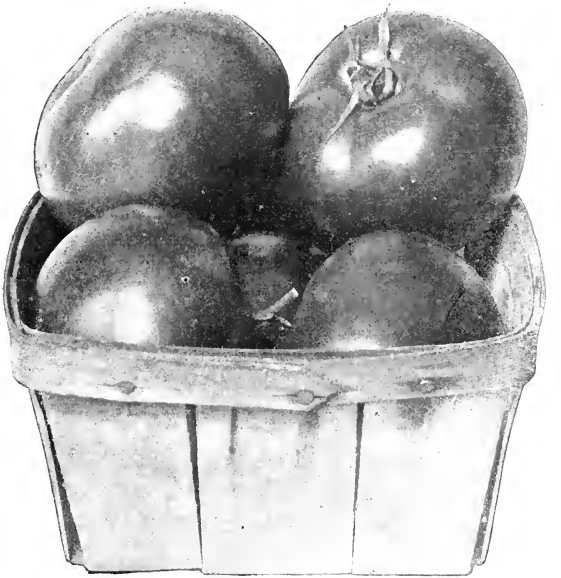


Fig. 149—Atlantic Prize Tomato.

almost detested; in ten years more every variety of pill and panacea was 'extract of tomato.'" It is now one of the most popular vegetables in cultivation, and springs up self-sown in all our gardens. There are many varieties. The following are among the best: Atlantic Prize, Acme, Beauty, Buckeye State, Chemin Market, Cardinal, Dwarf Champion, Early Ruby, Fordhook First, Golden

Queen, Henderson's Ponderosa, Ignotum, Lemon Blush, Livingston's Beauty, Livingston's Favorite, Matchless, Green Gage, Mikado, Volunteer, Moore's, New Peach, Paragon, Perfection.

A few specially desirable varieties for general use may be mentioned as follows: Early Ruby, Livingston's Beauty, Lemon Blush, Atlantic Prize, Ignotum, and Ponderosa.

The tomato likes a light, loamy soil, of moderate fertility, as in a soil too rich it runs to vine, and the fruit ripens late. For the early crop, sow at the first indications of spring, some six weeks before corn-planting time (early in February here and at the North in March) in a hot-bed, or in boxes in the house.

Sow in drills eight inches apart, and when the plants come up, thin to two or three inches, and transplant into the open ground when the frosts are over. While in the seed-bed give air at all times when there is no danger of frost. It is better to sow quite early and transplant when ready into small pots, and a couple of weeks after, when these are full of roots, shift them into five-inch pots, in which they may be kept until they blossom, if a late spring or apprehension of frost renders it necessary. Transfer them with the ball to the hill in the open ground in a cloudy, damp time, in fresh-dug soil. If the weather is dry they may be planted, the fresh soil pressed closely about the ball, a plentiful watering given, finishing with a covering of light soil to keep the ground from baking, and shade during the day until established. Let the rows be about four feet apart and the plants three feet in the row. In poor soil less room is required between the rows. As they are very tender, do not plant out until danger of frost is over, and protect them by large flower pots or boxes, if there is any fear of frost. For a succession, sow in the open ground about corn-planting time in a rich,

sheltered spot, water with tepid water in dry weather, shield them with a mat or box in cold nights, and thin the plants while young to three inches, and carefully transplant these, when ready, with a trowel and ball, into their final situation. In the Gulf States another sowing or two should be made, to keep up a full succession in the long summer.

As soon as the lower fruit is half grown, cut off the upper part of the plant above the larger fruit, that its growth may be stopped, and the fruit below will be larger and several days earlier. Ninety per cent. of the fruit grows within eighteen inches of the ground, but a large portion of the vines grow above that height. Tomatoes like the soil about them well hoed, and free from weeds. Plants grown in the open air are more abundant in bearing than those forwarded under glass. In well-trenched ground they will continue bearing until frost.

To Save Seed.—Select the largest early fruit, mash with the hand, and wash the seed from the pulp; spread out upon plates and dry in the shade; when dry, put them in paper bags.

Use.—Few vegetables are prepared in as many different forms as the tomato. It is pickled when green, and preserved when ripe; it is eaten raw or cooked; it enters into soups and sauces, and is prepared in catsups, marmalades, and omelets. The French, and the Italians, near Rome and Naples, raised them by the acre long before they were used by other nations, and, it is said, prepared them in an almost infinite variety of ways. There are very few preparations into which it enters which are not improved by the addition. A good supply should be prepared when in season by stewing and putting up in patent cans for winter use. On account of the acid of the fruit, earthen or glass jars are best.

MARKETING.—Tomatoes are shipped in bushel crates, and the top layer is carefully faced. Careful sorting of the fruit into grades depending on the degree of ripeness is required, and the packing must be done by laying the tomatoes in the crate one by one to insure quality and neatness. Some of the most successful shippers wrap each tomato in soft paper before packing.

TURNIP.—*(Brassica rapa.)*

The Turnip is a hardy biennial of the cabbage tribe, a native of many parts of Europe, and has been cultivated for centuries. It was held in considerable estimation by the Romans. Cato is the first writer that mentions it. "Sow it," says he "after an autumnal shower in a place that is well manured, or in a rich soil." Columella recommends its cultivation, "because that portion of the crop not wished for the table will be greedily eaten by the farm cattle." It is cultivated in all temperate climes, and is now extensively grown as a field crop in England, for feeding stock, and is considerably raised for the same purpose in our Northern States.

EXTRA EARLY PURPLE TOP MILAN is one of the earliest varieties; flat root, and smooth, sweet and tender.

EARLY WHITE DUTCH (Strap-Leaved).—A round, flat turnip, with short, narrow, strap-like leaves; is the earliest kind.

WHITE GLOBE is a beautifully shaped, globular root, of the largest size, a standard of excellence.

EARLY WHITE FLAT DUTCH.—An early, rapid grower and desirable white turnip. The roots are sweet and juicy.

YELLOW ABERDEEN is very hardy; more so than the foregoing. Sweet, fine-flavored, and very nutritious. It is of a yellow color, round, handsome shape, firm and sweet, and keeps well.

GOLDEN BALL.—An excellent yellow rooted turnip; solid and good flavor. A fine table variety.

RUTA BAGA, OR SWEDES TURNIP is a different variety (*Brassica campestris, var. ruta baga*), of which the foliage differs from those preceding in being smooth and covered with glaucous bloom. There are several varieties, all hardy and good.

PURPLE-TOPPED SWEDE.—The roots are very large, of an oval, tapering form, and the greater their size the sweeter and more nourishing they become. It keeps until spring.

Fig. 150—Sweet German Turnip.

SKIRVING'S IMPROVED SWEDE. This is of still better form than the foregoing, the leaves not so large, less smooth, and free from bloom; flesh fine, yellow, and very nutritious.

SWEET GERMAN TURNIP.—Called also White Ruta Baga and Cabbage Turnip (*Brassica campestris Napa Brassica, D. C.*), resembles the last two, but the flesh is white, very sweet, with somewhat of the cabbage flavor, and is a good keeper. Roots large, but not as regular as the preceding.

A good fertilizer, at the rate of 1,000 pounds per acre, is furnished by the following formula:

Cotton seed meal,	450 pounds.
Nitrate of soda,	250 pounds.
Acid phosphate,	900 pounds.
Muriate potash,	300 pounds.

For the spring crop manures rich in ammonia are essential, but for the autumn crop the superphosphate of lime seems to act more beneficially than any other application.

Culture.—The turnip likes a rich, sandy soil. If raised on ground manured by cow-penning, the crop rarely fails, as the urine deposited in the soil affords the phosphates so necessary for this crop, and in such places it is far less infested with insects. Soil fresh from the woods also suits it. For the early crop seed grown north of the locality in which it is sown is generally preferred, but for the main crop, pure seed from handsomely shaped roots of home growth is sufficiently good. In the more Southern States sow early turnips late in January, or through February, and farther North as soon as the ground is in a suitable condition, and the danger of its becoming again frozen is over; that is, when the atmosphere begins to feel like spring. Sow in drills fifteen inches apart, in fine, light, well-manured soil, in drills one inch deep, covering the seeds half an inch with fine soil pressed thereon. Keep the soil free from weeds. As soon as the plants get a little strong, thin out to two inches, and finally to six inches in the row. If the ground is not kept light and well worked, and the plants properly thinned, it is a mere waste of time and seed. The Early White Dutch and Early Milan are the kinds to be preferred. They do much better in drills than broadcast.

For fall turnips, sow the Early White Dutch, etc., any time in August and September, broadcast, or better in drills, as directed above. If broadcast, thin them to about twelve inches apart or more. If sown just before a rain, they will come up at once. Soot, wood ashes, and unslaked lime are all useful to promote growth and drive away insects. The last of July or the first of August is the time for sowing the main crop of common turnips, while in Georgia the last sowing for greens is made the first of November.

The varieties of the Ruta Baga and the Sweet German are the best when planted for late winter use. These are

sown at New York the last half of June, or early in July; in Georgia from the 1st to 20th of August. Sow in very rich, fresh-prepared soil. Let the drills be two feet apart, and thin the plants by degrees until twelve or fifteen inches in the row. As soon as the plants appear, loosen the earth about them. It requires a richer soil than the other varieties. Fill any vacancies in the row by transplanting; these plants will make nearly as large roots as the others. Keep the soil light and mellow by the use of the hoe. Large crops can be tended with the plow and cultivator to great advantage. In good soil the yield is immense. The crop may be drawn as needed. Some should be taken before they begin to grow up to seed and stored in a cool place for *late* keeping.

To Save Seed.—Select a few of the best roots, shorten the tap-root, and plant them two feet apart. Tie the stalks to stakes, and keep them at a distance from all other members of the cabbage tribe. Seed of the turnip should be changed every few years, as the plant degenerates. It keeps three years.

Use.—This is one of those useful vegetables that can be enjoyed with everything. The tops gathered in winter and spring make the greens much prized by us all in early spring. The roots are wholesome, though they disagree with some stomachs. They are considerably nutritious also; four ounces of White Dutch containing eighty-five grains of nutritive matter, and four ounces of Ruta Baga containing one hundred and ten grains of the same. Any over-supply of this crop may be fed with great advantake to cows and swine.

MARKETING.—When the turnip first comes into market it is shipped with the tops on, because these tops are often used for greens, but later in the season the turnips are shipped in barrels like potatoes, with the tops cut off.

WATER CRESS.—(*Nasturtium officinale.*)

This is a hardy, perennial, English, Cruciferous plant, growing in running streams. There is but one variety in use.

The Water-Cress likes a clear, cool, running stream, fresh issuing from a spring, the nearer its source the better, with the water about an inch and a half deep, with a sandy or gravelly bottom. It must, of course, at first be raised from seed, which can be sprinkled at the source of some gravelly stream. If once established, it will soon propagate from self-sown seed. If the stems get choked with mud and weeds they must be taken up and the beds cleared and replanted. The shoots ought always to be *cut*, as breaking injures the plants.

They grow best in water not over two or three inches deep, and if plants can be got, should be set in rows parallel with the stream, eighteen inches apart.

Use.—Water-cresses are generally liked for their warm, pungent taste, and are used alone or in mixed salads.

WATERMELON.—(*Citrullus vulgaris.*)

This is a trailing annual, a native of the tropics, and of the same natural family as the cucumber and musk-melon, but belongs to a distinct genus. It is a large, succulent, and refreshing, but not high-flavored fruit, and is probably the melon mentioned in the Bible. The varieties are numerous, many of them not being known out of a limited locality. The following are general favorites:

BOSS.—A melon with a thin dark rind. A good shipper. The flesh is deep red and fine flavor. Oblong shape. This is an early melon and very productive.

ARKANSAS TRAVELLER.—This was introduced by Landreth, and has been recommended by some of the experiment stations as a superior melon. "Rind dark green

with wavy stripes of black, the edible portions extending within half inch of skin; flesh brilliant red, sweet and tender; very juicy."

DIXIE.—A cross from the Mountain Sweet on the Kolb Gem. Ripens earlier than Kolb Gem.

FLORIDA FAVORITE.—This is pronounced to be by many one of the best melons on the market. The flesh is red and fine flavored.

THE JONES.—This and the Kolb Gem are shaped alike. The flesh is red and remarkably sweet. The melon grows

Fig. 151—McIver's Watermelon.

to a large size. Some of the experiment stations place this variety at the head of the list.

KOLB GEM.—This melon originated near Eufaula, Alabama, and is named after Captain R. F. Kolb, its originator, one of the prominent citizens of that State. It has been largely grown for shipment North because of its tough rind and firm, bright red flesh.

RATTLESNAKE.—This fruit is an old variety, well known in Georgia and other sections of the South. Oblong form and when fully developed, possesses fine qualities in flavor. It is not a good shipping melon.

MCIVER SUGAR MELON.—A variety originating in

South Carolina, raised by Colonel E. R. McIver, of Dar-

Fig. 152—Dixie Watermelon.

lington, and mentioned by the North Carolina Experiment Station as standing next to the Jones in quality.

The following are also classed as superior melons by experimenters: LONE STAR, PRIDE OF GEORGIA, SCALY BARK, SUGAR LOAF.

See spraying calendar for remedies against diseases.

Culture.—The watermelon likes a deep, rich, sandy soil. Where this plant is most successfully cultivated, it always grows upon sand. The hills should be not less than ten or twelve feet apart in warm climates, and seven or eight at the North. Do not plant until the ground is warm, and cultivate exactly in the same manner as the muskmelon and cucumber. It should not be grown within one hundred feet of other melons, gourds, etc., if you would gather pure seed. Protect from insects as directed in the article, *Cucumber*. The melon worm does not annoy the watermelon.

Use.—This is a wholesome fruit, very popular in summer from its beauty and the refreshing coolness of its juice. It is not very nutritious, as it contains ninety-five per cent. of water. It is not by any means as nourishing as the muskmelon, and lacks its peculiar rich flavor. The outer rind is used for preserves. In many parts of Europe the juice is boiled into a pleasant syrup, or made into beer.

MARKETING.—This is done in box-cars which are well ventilated. The smaller melons are placed on the bottom and the larger at the top. The smaller will stand pressure better. Pack securely to prevent the melons from moving about during transit.

HERBS FOR MEDICINAL PURPOSES.

A few roots of the most useful of these should be found in every garden. The medicinal properties of many of them depend upon their aromatic qualities, and they are never so fragrant and full of virtue when grown upon

ground highly manured. Chamomile, lavender, rosemary, rue, wormwood, and many others lose much of their strength when forced into rank growth. Common garden soil, without manuring, is quite good enough. Whenever the plants begin to decline, take away the old surface soil, and apply fresh, or set out new plants in fresh ground

Medicinal, pot, or sweet herbs, as a general rule, should be gathered when in *bloom*, and dried carefully and thoroughly in the *shade*. When thoroughly dry, press them closely into paper bags, or powder them finely; sift, and keep in closely-stopped bottles.

ANGELICA (*Archangelica officinalis*) is an Umbelliferous biennial plant, growing from three to five feet high, and a native of many parts of Northern Europe. The whole plant is powerfully aromatic. Its roots have a fragrant, agreeable odor, and at first a sweetish taste, which soon turns acrid in the mouth. Its medical properties are aromatic, stimulant, and gently tonic.

Its stalks were formerly blanched and eaten like celery, but it is mostly cultivated to make a sweetmeat from them when young and tender. They are also candied by the confectioners.

Sow the seed one foot apart in August or September, and when they get about four inches high, the next spring, set them in rows two feet apart each way. Though the plant is only a biennial, yet by cutting down the seed-stalk whenever it rises, the same plant may be preserved several seasons. Angelica likes a moist, cool soil, such as the banks of ditches.

ANISE (*Pimpinella anisum*) is an Umbelliferous annual, a native of Egypt. It is cultivated for its seeds, and its leaves, which are occasionally used as a garnish, and for seasoning like fennel. The seeds have a fragrant, agree-

able smell, and a sweetish, pleasant taste. They are useful wherever an aromatic stimulant is required.

The plant grows about eighteen inches high. Sow the seed where it is to stand in spring, in a dry, light soil, and thin out the plants, if too thick, to three or four inches apart.

Fig. 153—Bene.

Balm (*Melissa officinalis*) is a hardy, Labiate-flowered perennial, native of Switzerland and the south of France, but has long been cultivated in gardens. It has an aromatic taste, and a grateful, fragrant smell, a little like lemons.

It is a square-stemmed plant, rising about two feet high. It is used in making balm tea, a grateful drink in fevers, and for forming a pleasant beverage called balm wine. It is a great favorite with the bees.

Any garden soil will do for balm. It is readily propagated either by slips, or by parting the roots in

spring. Plant ten inches apart, giving water if dry weather.

BENE (*Sesamum orientale*) is an annual plant, and a native of Africa and India. Introduced into this country by the negroes. It grows from three to six feet high, bearing numerous pods, filled with smallish seed. These are used for food in many parts of the world, and are also cultivated for the oil with which they abound. The oil resembles that of olives, and is nearly as good. The leaves abound in mucilage; one or two stirred in a half pint of water will form a bland mucilaginous drink very useful in cholera infantum, dysentery, and summer complaints generally. The leaves should be freshly gathered, and enough may be added to make the water ropy without affecting its color or taste.

Sow a row in spring, on the edge of a plot or border, and thin out as the plants require room. A few plants will furnish all the leaves desired.

BONESET, OR THOROUGHWORT (*Eupatorium perfoliatum*), is a Composite-flowered perennial, a native of most of the United States, which, if not found growing wild in the vicinity, should be cultivated, as it is one of the best herbs in family practice. It has a faint odor, an intensely bitter taste, and is slightly astringent. Its medicinal virtues are diaphoretic, tonic, and in larger doses, emetic and aperient. It is principally used as a diaphoretic in colds, catarrhs, and rheumatism, in intermittent, remittent and inflammatory diseases, or given cold as a tonic in dyspepsia.

Boneset can be raised by transplanting the roots or sowing the seed in spring.

BORAGE (*Borago officinalis*) is an annual European plant. The tender tops, young leaves, and flowers are sometimes used as a salad by the French, and boiled by the Italians.

Medicinally it was formerly thought endowed with very great virtues, and numbered among the four cordial flowers.

Old Gerard says: "Those of our time do use the flowers in salads, and to exhilarate and to make the minde glad. There be many things made of them used for the comfort of the heart, to drive away sorrow and increase the joy of the minde." The plant is not much used now except as an ingredient in the drink called "a cool tankard," made of wine, water, lemon-juice, and sugar, to which a few of the tender leaves seem to give additional coolness.

Sow early in spring, broadcast, and a little thinning and weeding is all the attention that will be needed.

CARAWAY (*Carum Carvi*) is a native of England and various other countries of Europe. It is a biennial, Umbelliferous plant, well known to the ancients. Pliny mentions it. Caraway is cultivated for its aromatic seeds, which are useful in confectionery, as in cakes, comfits, etc., and the leaves are sometimes used in soups. The roots are said to excel those of the parsnip, being formerly cooked and used in the same manner. Medicinally the seeds are used in an infusion for flatulence. Sow in autumn, or early spring, and thin so as to give each plant ten inches of room. Keep free from weeds. Plants sown in autumn will give seed the next season.

CHAMOMILE (*Anthemis nobilis*) is a hardy, Composite-flowered perennial, a native of England, cultivated for its flowers, which have a bitter, aromatic taste, and are in small doses a useful tonic, but given largely, act as an emetic. An infusion of them improves digestion and gives tone to the disordered stomach. The flowers are sometimes chewed as a substitute for tobacco.

It is best propagated by dividing the roots in spring. Keep the ground free from weeds. Plant nine inches apart. As to varieties, the single-flowered has the most

virtue, but the double-flowered is most cultivated, from its greater productiveness.

CLARY (*Salvia sclarea*) is a Labiate-flowered biennial from Italy. The leaves of this plant were formerly used in soups, and its flowers are now made use of in a fermented wine.

The medicinal virtues of the plant are cordial and astringent, and it is used either in its fresh or dried state. For propagation and culture, see *Sage*, which belongs to the same genus. Clary, however, must be yearly renewed by fresh sowing. Thin the plants to fifteen inches apart each way.

CORIANDER (*Coriandrum sativum*) is an Umbelliferous annual from the East, and also grows naturally in the south of Europe. Some like its tender leaves for soups and salads, but it is raised mostly for its seeds, which have a pleasant aromatic taste, though the smell is disagreeable. Coriander seed is carminative and stomachic. It is often used to disguise the taste of medicines, but it is principally employed in confectionery.

Sow the seed in spring or autumn, where they are to remain, in drills twelve inches apart. Thin the plants to four inches, and keep free from weeds.

DILL (*Anethum graveolens*) belongs to the same genus with Fennel, and is a biennial, Umbelliferous plant, a native of Southern Europe, cultivated for its seeds, which have an aromatic odor, and a warm, pungent and somewhat bitter taste. Medicinally, they are good for flatulence and colic in infants. The leaves are sometimes used for culinary purposes, and the seeds are occasionally added to pickled cucumbers to heighten the flavor.

Sow the seeds either early in the spring, or soon after they are ripe, in a light soil. Thin, if crowded, and keep clean. The plants should be eight inches apart.

ELECAMPANE (*Inula Helenium*) is a native of England and Japan. It is a Composite-flowered, perennial plant, cultivated for its thick, fleshy, carrot-like root, which is useful as an aromatic tonic and expectorant. Cut up fine and fed with their corn, the root is a great relief to the distemper in horses.

It is propagated by offsets, or by parting the roots in autumn or spring, but may also be grown from seeds sown in the fall. It likes a moist soil, and the plants should be fifteen inches apart.

FENNEL (*Foeniculum vulgare*) is a hardy, aromatic, perennial, Umbelliferous plant from the south of Europe, growing wild on the banks of rivers and perhaps quite as properly belongs to the culinary as to the medicinal department of the garden. It has a finely divided leaf, and tall, umbel-bearing stems, crowned with small yellow flowers.

Culture.—Fennel will grow in almost any soil. It is propagated by offsets, parting the roots, or by seed; all which modes may be successfully practiced at any time in autumn or spring.

The best season, however, for sowing the seed is when it ripens in the fall. The seed may be sown moderately thick in drills (which should be twelve inches apart) about half an inch deep, and the earth pressed upon them. When the young plants are four or five inches high, thin them out to twelve inches. Those taken up may be planted out to enlarge the bed. Water them freely, if the weather is dry. Keep the plants free from weeds, which is all the cultivation required. If the seed is not desired, the stems should be cut down as often as they run up; for if allowed to ripen seed, the old plants will last but a few years. But this is of little consequence, as plenty of self-grown seedlings will be ready to take their place. Eight or ten roots are enough for any family. It

should be kept within proper limits, as it is much inclined to spread.

Use.—Fennel is a good deal used in continental Europe in soups, fish-sauces, garnishes, and salads. It is also considerably used in England, but less with us. The Italians blanch and eat the stalks of one variety called Finochie, like celery. A little fennel seed sometimes gives an agreeable variety in flavoring apple-sauce and pies. But it is most used medicinally. The seeds are carminative and stimulant, and in an infusion are excellent for the flatulent colic of infants.

Horehound (*Marrubium vulgare*) is a hardy, Labiate-flowered, perennial plant, a native of most parts of Europe, growing in waste grounds, among rubbish, in warm, dry situations. It has a strong aromatic smell, and a bitter, pungent taste, which is permanent in the mouth; medicinally, horehound is a tonic, somewhat stimulant and diuretic, and, in large doses, laxative. It enters largely into the composition of cough syrups and lozenges.

Sow the seeds in the spring in any common soil. It scarcely needs any attention. It may also be propagated by dividing the roots. Plant eighteen inches apart.

Hyssop (*Hyssopus officinalis*) is a Labiate-flowered, hardy, evergreen undershrub, from the south of Europe, of which the leaves and flower-spikes are the parts used medicinally. It has an aromatic odor, and a warm, pungent taste. It is stimulant and expectorant.

Hyssop is propagated by slips, or dividing the roots, or by sowing the seed in the spring. Transplant the young plants to where they are to remain, or you may thin them to six inches apart, and leave them in the seed-bed until autumn before transplanting. It likes a dry, sandy soil, and about eighteen inches space should be given to each plant.

LAVENDER (*Lavandula vera*) is a Labiate-flowered undershrub, a native of the south of Europe, and hardy south of New York. It is cultivated for its fragrant spikes of flowers, which are used for the distillation of lavender-water. Being dried, and put up in paper bags, they are also used to perfume linen. Both flowers and leaves are very aromatic. It has an agreeable pungent bitterness to the taste, and its medicinal properties are stimulant, cordial, and stomachic. There are three varieties—the *narrow-leaved*, one sort with blue and the other with white flowers, and the *broad-leaved* lavender.

Lavender may be propagated by seeds, slips, or cuttings. Sow the seed in drills ten inches apart, in spring, and transplant the next spring to a dry soil of but medium richness, and it will be more highly aromatic. Give each plant about two feet of space; for drying, gather the flowers before they begin to turn brown at the lower part of the spike.

LIQUORICE (*Glycyrrhiza glabra*) is a Leguminous, hardy perennial from Southern Europe, the saccharine juice of the fleshy root of which is useful in catarrhs, fevers, etc. Its taste is sweet and mucilaginous, and it is much used as a demulcent, either alone or combined with other substances.

A few roots of this plant, when once started, will be of very little trouble in the garden. The plant is propagated early in spring by cuttings of the roots. Dig the soil at least two feet deep. Take the horizontal roots of established plants, five or six inches long. Every shoot planted should have at least two eyes; make the rows three feet apart, and the plant twelve to fifteen inches in the row, and cover the roots well with mould. Onions, lettuce, or radishes may be grown between the rows the first year; afterwards keep the soil free from weeds, dress the surface with manure every autumn, and at the end of the

third year take up the crop as soon as the leaves are fully decayed, and dry the roots thoroughly. In shallow or poor ground, it will not succeed.

MINT (*Mentha*).—Three species of this genus of Labiate plants are cultivated, all hardy perennials, natives of Britain.

SPEARMINT (*Mentha viridis*) belongs rather to the culinary than the medicinal department of the garden. It is employed in sauces and salads, as well as dried for soups in winter. A few sprigs of mint, boiled a little time with them, and then withdrawn, are thought by some to improve the flavor of green peas. Its is also used in preparing mint-julep. Its medicinal properties are aromatic, stimulant, and stomachic. The leaves, boiled in milk, are useful in diarrhea. Its infusion is good to prevent nausea. There are two varieties—the broad and narrow-leaved—equally good.

PEPPERMINT (*M. piperita*) has a strong, agreeable odor, a pungent, aromatic taste, giving a sensation of coldness in the mouth. Its medical properties are aromatic, stimulant, and stomachic. The essential oil and essence are the forms in which it is employed in medicine, and they are also largely used in confectionery and cordials.

PENNYROYAL (*M. Pulegium*) is more acrid than the other mints, and its taste and smell are less agreeable. It possesses their warm, pungent flavor, and other general properties, but is not so good a stomachic. The American pennyroyal belongs to a different genus, *Hedeoma*.

All these species require a tenacious soil, which is all the better if moist, or even wet.

A border sheltered from the midday sun, but not entirely secluded from its influence, is always to be allotted them, as in such a situation they are most vigorous and constant in production.

They are readily propagated by dividing the roots in

the winter or spring, or by cuttings planted in moist soil during summer. Plant in rows nine inches apart each way, and cover the roots about two inches deep. In autumn clean off the old stems, and add two inches of mould to the raked surface. Through the summer remove grass and weeds. Make new beds every three or four years.

ROSEMARY (*Rosmarinus officinalis*) is a Labiate-flowered, hardy, evergreen undershrub, a native of the south of Europe. It has a fragrant, grateful odor, and a warm, aromatic, bitter taste. Its medicinal virtues are tonic.

It was formerly believed that this plant gave strength to the memory. The tender tops are the parts used in medicine.

Rosemary may be raised from seed, or by planting slips or cuttings in the spring or autumn. Sow the seed in drills sixteen inches apart. Transplant the next spring or autumn. Two or three plants will be enough.

RUE (*Ruta graveolens*) is a perennial evergreen undershrub of the Rue family from the south of Europe. It flowers all summer, and is very well known from its peculiar strong, unpleasant smell. Its taste is bitter and pungent, and the leaves so acrid as to blister the skin. It is a very powerful medicinal agent, too much so to be generally used in family practice.

Rue is propagated by seeds, cuttings, or slips. It must not have a very rich soil, nor be suffered to run to seed. Sow the seed and cultivate as hyssop.

SAGE (*Salvia officinalis*) is a Labiate-flowered, hardy evergreen undershrub, a native of the south of Europe. It has been cultivated from the earliest times, was classed among the heroic remedies, and considered the best of medicines for prolonging human life. An old Latin adage is "Cur moriatur homo cui salvia crescit in

horto?" "Why should a man die while sage is growing in his garden?" It grows about two feet high, with wrinkled ashy green leaves, and terminal blue flowers in long spikes. It has a fragrant smell and a warm, bitterish aromatic taste.

Culture.—Sage is raised from seed, slips, or cuttings. It likes a dry, fertile soil. Sow the seeds on a gentle hotbed, or in the open ground early in spring, in shallow drills, eight inches apart. Press the earth upon the seed, covering them not over half an inch deep. Thin the plants, when well up, to half a foot apart, planting those taken up at a similar distance. Keep the soil light and free from weeds. In the autumn, or the next spring, plant them out in rows eighteen inches each way. Layers and rooted offsets may be set out at once at this distance. Cuttings of the outward shoots of the current year's growth, planted out in a shady border, in moist weather, readily take root; set them in rows six inches apart. In autumn or spring, take them carefully up and set them out in their final stations. Trim the plants to a round, bushy head. Gather and dry the leaves for winter use, but do not trim the plants too closely, especially in autumn or winter.

Use.—The leaves are used for seasoning stuffings, sauces, and many kinds of meat, as well as to improve the flavor of various other articles of cookery. Medicinally, its infusion is given warm as a sudorific, or mingled with vinegar and alum, is an excellent gargle in sore throat. It is stated by Bomare that it was exported formerly by the Dutch to China, and it was so much preferred by the Chinese to their own tea, that they willingly exchanged two boxes of it for one of sage.

SOUTHERNWOOD (*Artemisia Abrotanum*) is a hardy evergreen, with fragrant, finely-divided leaves, nearly allied to wormwood, both being species of the same genus, and

similar as to medical properties. Like wormwood, it has a grateful odor, but it is not much used in medicine from its nauseous taste. As an ornamental evergreen, it is worth cultivating.

For culture, see *Hyssop.*

Tansy (*Tanacetum vulgare*) is a hardy, Composite-flowered perennial, a native of Europe, long cultivated in gardens. It was formerly used to give flavor to puddings and omelets.

Its medicinal properties are tonic and stomachic. It is also a vermifuge. It was formerly of very general use in the preparation of alcoholic bitters.

Divide the roots, and set out a few slips in autumn or spring. After it is well rooted, be careful you do not get too much of it. There are two varieties—the common and the curled.

Wormwood (*Artemisia Absinthium*) is a native of Europe, and is a hardy, Composite-flowered perennial, cultivated much in gardens. Its odor is strong and fragrant, and its taste aromatic, but intensely bitter. It is cultivated for the tops or extremities of the branches. Its properties are tonic and diuretic, and it is a vermifuge.

Wormwood likes a calcareous soil, and may be raised either by cuttings, seeds, or dividing the roots. Cultivated same as hyssop, the roots being eighteen inches apart. A dry, poor soil is necessary to bring out the peculiar virtues of this plant.

Roman Wormwood (*A. Pontica*) is less nauseous than the preceding, and generally preferred.

CHAPTER XVI.

FRUITS—VARIETIES AND CULTURE.

ALMOND.—*(Amygdalus communis.)*

The Almond is a native of Asia and Northern Africa. It is a tree of medium size, nearly allied to the peach in habit and general appearance. The leaves are similar to the peach, having glands like some varieties of the latter fruit, and flowers of similar shape, but much larger and more ornamental, varying in color from pure white to a fine blush. The chief difference is in the fruit, the stone of the almond being flatter, not so hard, and covered with a woolly skin that opens spontaneously when the kernel is ripe.

In Southern Europe the almond is much cultivated, and large quantities of nuts exported. The kernel is the part used; the sweet varieties, whether green or dry, form a very nutritious article of food, and a most agreeable addition to the dessert. Almonds are used in confectionery, cooking, perfumery, and medicine. The bitter almond is the kind used in perfumery and flavoring; it contains prussic acid, which, though a violent poison, is not thought injurious in the small quantities required for these purposes.

Cultivation.—A warm, dry soil is most suitable for the almond, which is cultivated exactly like the peach, and is subject to the same diseases; it may be budded on the almond, peach, or plum stock. The almond cannot be successfully cultivated in the middle or northern portions of the South. The varieties are:

Common Almond.—Nuts one and one-fourth inch long, hard, smooth, compressed, and pointed, with a kernel of

agreeable flavor. The hardiest and most productive variety, and is the common hard-shelled almond of the shops; flowers open before the leaves appear.

The Princess and Sultana are varieties extensively cultivated in Europe and produce nuts with thin shells. They are prolific and excellent varieties. Another European variety is Pistache, which yields a nut of a delicate sweetness.

THE APPLE.—*(Pyrus Malus.)*

The Apple probably originated from the European Crab, but centuries of cultivation and reproduction from seeds of new and improved varieties have brought it to its present state of perfection in quality, size and beauty.

Where the apple can be grown and preserved in perfection, it is the most useful of fruits. Varieties can be selected which will afford a succession through the entire year.

They can be thus preserved in our own mountain region, from which excellent fruit is brought as late as the month of May. The best varieties are excellent dessert fruits. For the table, they are prepared in many ways, as baking, stewing, in pies, tarts, puddings, dumplings, jellies, and preserves. They are also dried for winter use.

The best mode of propagating the apple is by budding or grafting on seedling stocks. For the raising of stocks, the seed should be sown in the fall, or early winter, in good soil, in rows eighteen inches apart. Transplant them in rows four feet apart, and one foot apart in the row. If any of the plants become infested with woolly aphis, wash them with tobacco water. The young grafted trees should be planted in the orchard when one or two years old, at distances of twenty-five to thirty feet apart.

Analysis shows that one-half the ash of the bark of the apple, and over one-sixth of that of the sap-wood, is lime.

When this mineral is not abundant in the soil, the tree cannot be kept healthy. Swamp muck or leaf mould, composted with lime and bone-dust, or ashes, are the best manures for the apple tree. The best soil for the apple, in this climate, is a deep, cool, moist loam; a northern, or northwest aspect, is preferable to any other. One of the greatest difficulties to be encountered in the cultivation of the apple is the sun-burning of the trunk, which can be prevented by training the trees with low heads, so as to shade their trunks from the rays of the sun.

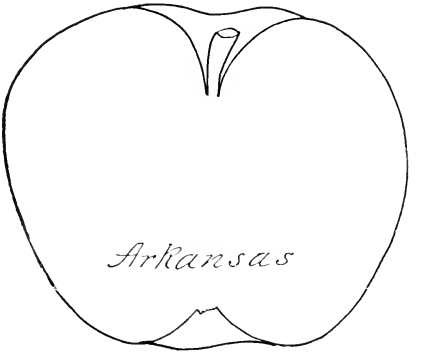


Fig. 154.

By shortening in the branches of the young trees, when transplanted into garden or orchard, they can be made to put out branches about two feet from the ground, which is about the proper height to form a good top. The apple tree needs but little pruning; removing the water-sprouts and such limbs as cross each other is about all that is required.

The following varieties are of general interest and are adapted to most sections of the South:

ARKANSAS (Black Twig).—Good average size, round

oval, with a glossy surface and yellowish red; lighter colored dots; flesh yellow and fine grained; flavor mild, with a subacid juicy taste; ripens late. Originated in Arkansas. Useful for marketing and kitchen purposes.

BALDWIN.—Average size, oval conical, yellowish red in color; mild flavor, with rich subacid taste; good winter apple, and very productive.

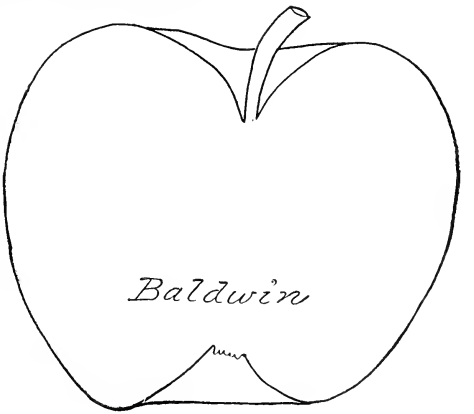


Fig. 155.

BEN DAVIS.—Large, round and yellow striped; flavor mild; flesh light colored; late in ripening; good for market purposes.

BOUGH.—Large size; oblate in form; skin bright yellow; thickly dotted with russet specks; stalk rather long, in a deep, narrow cavity; calyx deeply sunk; flesh white, juicy, and very sweet; tree a poor grower.

BYERS, BUCKINGHAM, BATCHELOR.—This very popular apple is known by fifteen or twenty names, but generally called Buckingham. Fruit large to very large; a little oblate in form, narrowing toward the eye; skin rich yel-

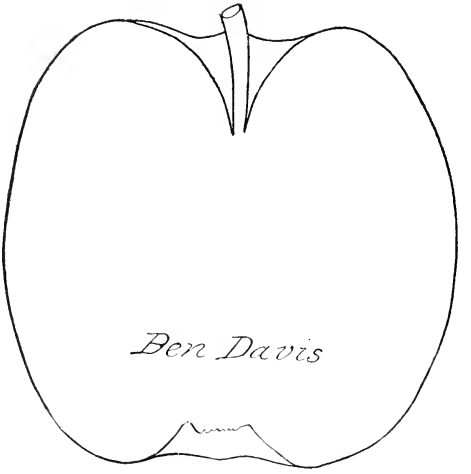


Fig. 156.

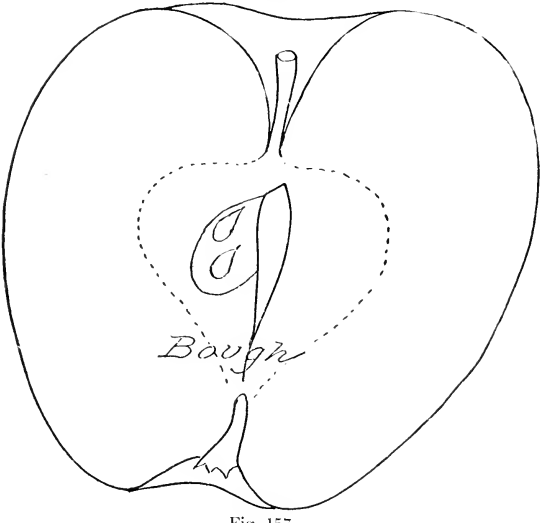


Fig. 157.

low, nearly covered with bright red; dark crimson on the side exposed to the sun, sprinkled with white specks; calyx small, open, in a rather deep basin; stalk very short and fleshy, inserted in a moderate sized cavity, which is russeted; flesh white, tender, fine grained, juicy

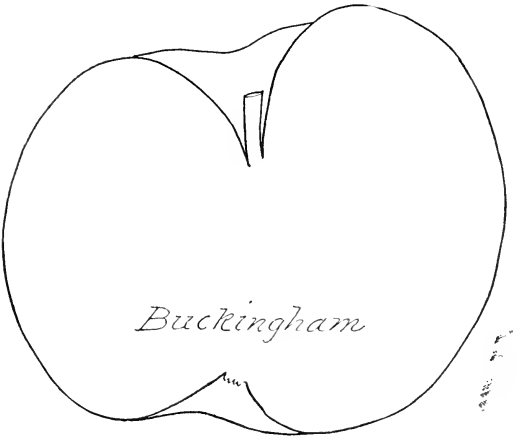


Fig. 158.

and rich, of a subacid flavor. Ripens in October. A splendid fruit.

BUFF.—Fruit of the largest size, roundish and somewhat ribbed and angular; skin thick; ground color yellow, but striped and shaded with dull red, marked with a few greenish spots; stem three-fourths of an inch long, in a medium cavity; calyx in a large, irregular basin; flesh yellowish, and, when well ripened, tender and good, sometimes indifferent. Ripens October to March.

CAMAK'S SWEET.—Fruit medium to large; nearly round; dull, whitish-green, mottled with green russet, the patches of which are made up with small dots, with a

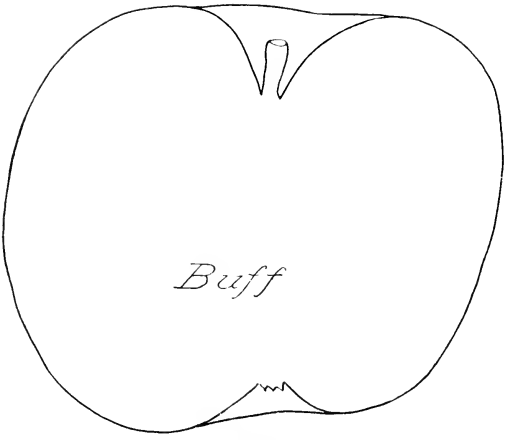


Fig. 159.

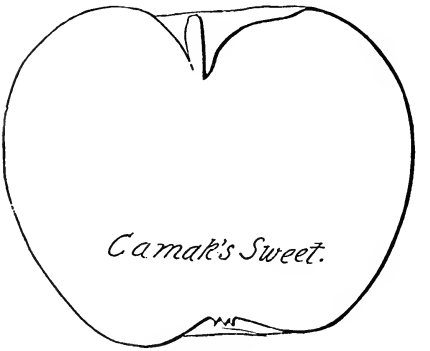


Fig. 160.

dull blush cheek toward the sun; stem short and slender; cavity and basin broad; calyx closed; flesh firm and tender; scarcely sweet, juicy and fine flavored; best. Keeps until February.

CAROLINA AROMATIC.—Fruit large size; oblate in form, tapering to the eye; stalk short and fleshy, in a deep, wide cavity; calyx in a wide, shallow basin; color green,

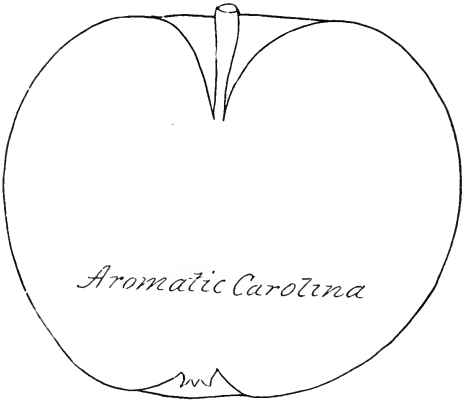


Fig. 161.

striped with dull crimson, and covered with white bloom; juicy and of a fine aromatic flavor. Tree a vigorous grower and very productive. Ripens July 15th to August 1st.

CARNATION.—Medium size; a delicious subacid apple; dark red, splashed with russet; flesh white, brittle and very juicy; both stalk and calyx are sunk in deep depressions; no autumn apple is superior; ripens August 10th.

CULLASAGA.—Large, regular, and a little conical; skin yellow, and nearly covered with crimson; calyx small, in a moderate basin; stem short and fleshy; flesh yellow,

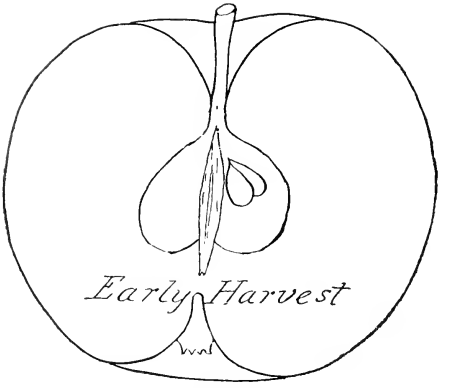


Fig. 162.

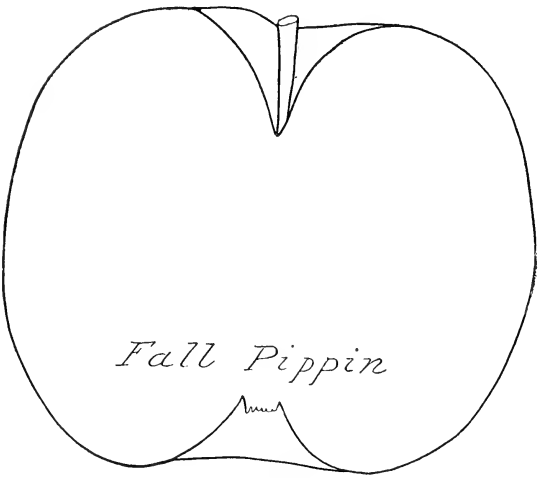


Fig. 163.

tender and juicy, of a fine aromatic flavor. Ripens in October; A first-rate variety; a seedling from the Horse Apple, by Miss Ann Bryson, of North Carolina.

DISHAROON.—Fruit large, nearly round; skin thin, pale green; stem about three-fourths of an inch long, slender, inserted in a moderate sized cavity; calyx open, of common size, in a small basin; flesh yellowish, tender, juicy, and of an excellent mild, acid, aromatic flavor. Ripens in September. A native of Habersham county, Georgia.

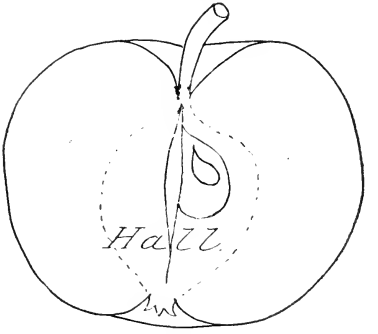


Fig. 164.

EARLY HARVEST.—Fruit medium to large size, round, sometimes flattened; skin smooth, with a few white dots, and of a pale yellow color; stalk half to three-fourths of an inch long, slender, in a moderate cavity; calyx in a shallow basin; flesh white, tender, juicy, crisp; flavor rich, sprightly, and subacid. One of the best northern varieties; ripens from the 15th to the 20th of June.

FALL PIPPIN.—Fruit very large, roundish, flattened, obscurely ribbed; stalk three-fourths of an inch long, in a deep, narrow cavity; calyx small, in a deep, narrow basin; flesh tender and mellow, with a rich, aromatic, subacid flavor. A splendid apple here. Ripens in August.

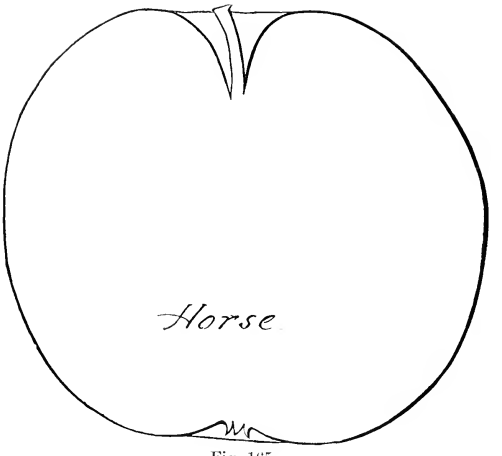


Fig. 165.

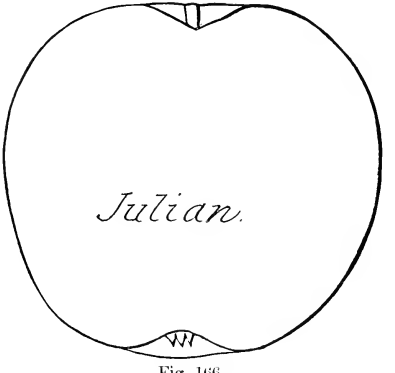


Fig. 166.

HOCKETT'S SWEET.—This apple originated in North Carolina; medium size; round oval; yellow reddish striped; sweet flavor, and rich in taste; flesh yellow, but coarse grained. Ripens in winter.

HALL.—Originated in North Carolina; small apple; oblate conical; red in color with russet dots; mild flavor with yellowish flesh, and aromatic flavor; suitable for dessert. Ripens in winter.

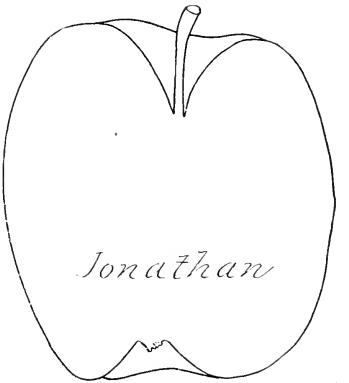


Fig. 167.

HORSE.—Size medium to large; conical in form; skin thick, golden yellow, when thoroughly ripe, with a blush cheek on the sunny side, a little russeted about the stem; stem short, and rather large, in a shallow cavity; calyx in a narrow basin; core large and hollow; seeds few; flesh yellow, firm, coarse grained, with a rich acid flavor. Best known variety for drying. Ripens August first. Tree vigorous and very productive.

JULIAN.—Fruit medium size, roundish, tapering somewhat to the eye; calyx small, in a narrow basin; stem short, in a moderate cavity; skin thin, yellowish-white,

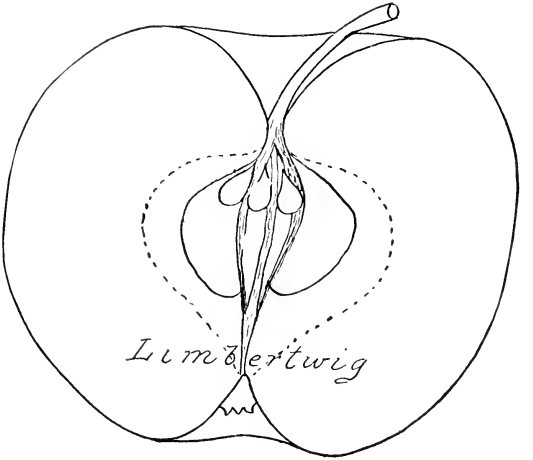


Fig. 168.

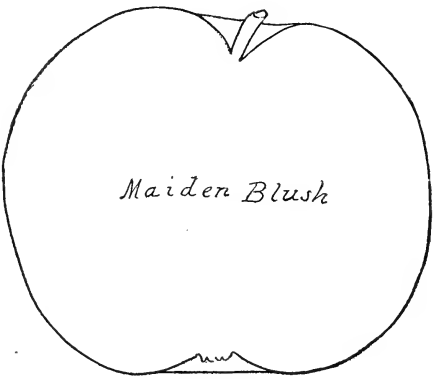


Fig. 169.

beautifully striped and marbled with carmine; the fruit is of a delicate, waxen appearance; flesh white, tender, juicy, and fine flavored. The best summer apple known; tree a fine grower and very productive. Ripens the middle of July; rarely affected by worms.

JONATHAN.—Medium size; round conical; yellowish-red striped; flesh white, mild in flavor and juicy; suitable for dessert and market; keeps well; winter apple. Originated in North Carolina.

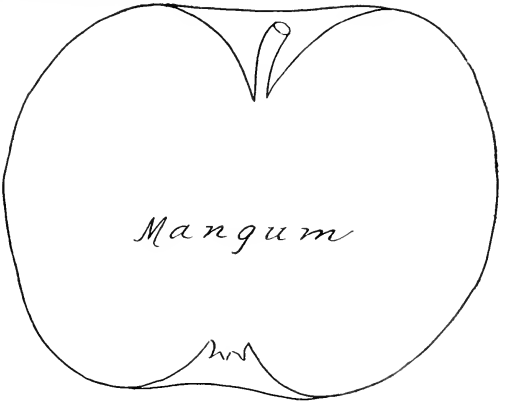


Fig. 170.

LIMBERTWIG.—Fruit large, dull red; flesh yellowish firm; not very high flavored; round oblate conical; winter; suitable for market. The pendant branches give the tree its name. It originated in Virginia.

MAIDEN'S BLUSH.—Fruit medium size; flat, smooth, and fair; skin thin, clear lemon yellow, with a fine blush to the sun; stalk short, in a wide, deep cavity; calyx closed, in a moderate basin; flesh white, tender, sprightly, subacid. Excellent for drying and culinary uses, and a fair dessert fruit. Ripens the first of July.

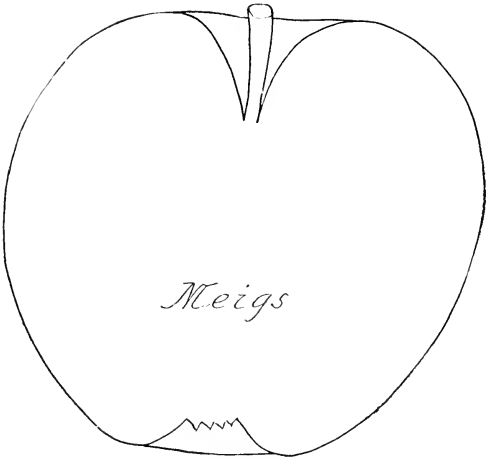


Fig. 171.

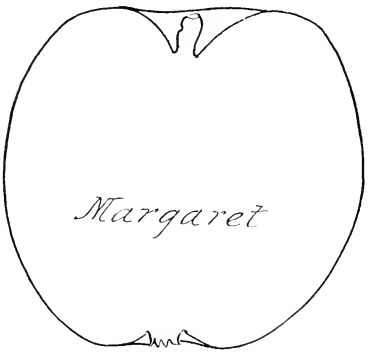


Fig. 172.

MANGUM.—Size small to medium; regular, slightly conical; stalk small, in a narrow cavity; color green; nearly covered with dark red stripes; flesh yellow and firm; of excellent quality and keeps until March.

MOUNTAIN BELL.—Size medium to large; oblate and conical; color an orange ground, shaded and striped with red; stem short, in a wide, deep cavity; calyx in a moderate size, smooth basin; flesh white, hard and juicy, a little rough in texture, and of a fair, subacid flavor.

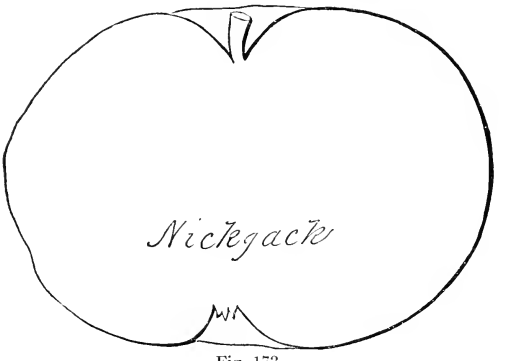


Fig. 173.

Ripens November to May. Second quality, but a famous keeper. A native of Habersham county, Georgia; found in an old Indian field by J. Van Buren.

MEIGS (Buncombe, Red Winter Pearmain, Red Fall Pippin).—Fruit large, regular, oblong, narrowing to the eye, sometimes slightly ribbed; skin yellow, but mostly covered with a marbling red, and sprinkled with prominent yellow dots; calyx small, closed, and set in a narrow basin; stalk very short, thick, in a deep, narrow cavity; flesh yellowish white, tender, juicy, with a rich, slightly subacid flavor. A fine native variety. Tree thrifty, and

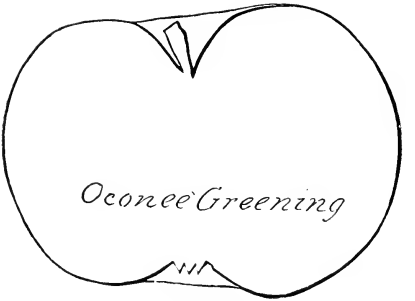


Fig. 174.

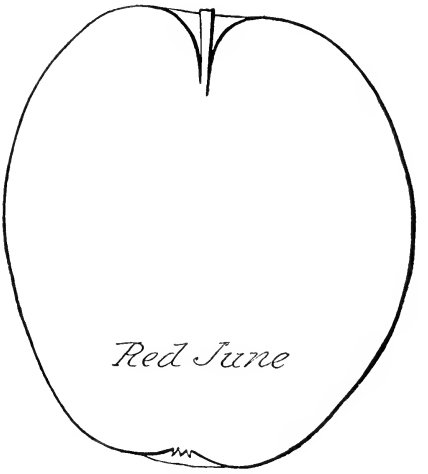


Fig. 175.

less infested with woolly aphis than many others. Ripens in September.

MARGARET (Early Red, Striped June).—Small apple, round ovate; yellowish red, with russet; basin shallow, with long stalk; mild flavor, quality fair; suitable for dessert; ripens in summer.

NICKAJACK.—Fruit large to very large, of an oblate form; color a yellow ground, striped with dark red, sprinkled with russet specks; calyx large and open, set in

Fig. 176.

a broad, shallow basin; stem short, in a regular cavity; flesh juicy, tender and rich, mild acid. Ripens late and keeps well until April. Originated by John Summerour, of Burke county, North Carolina.

OCONEE GREENING.—Medium size, and resembles the Disharoon a good deal in external appearance, but keeps well much longer, and is of a more acid flavor. Originated in Georgia. Good dessert apple. Ripens in Autumn.

RED JUNE.—Fruit medium size, generally oblong in form; skin smooth, green in the shade, changing rapidly,

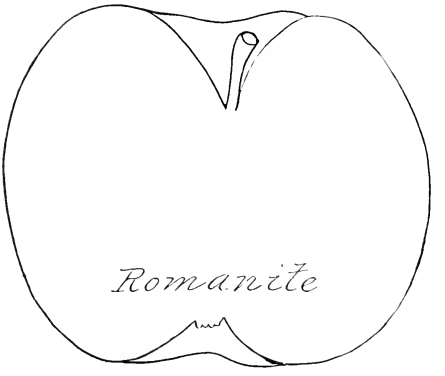


Fig. 177.

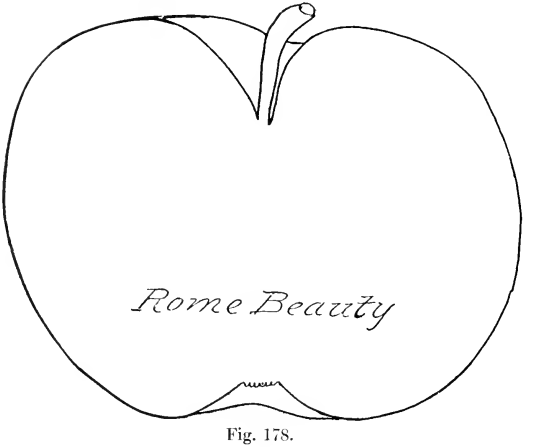


Fig. 178.

at maturity, to a fine dark crimson; stem half to three-fourths of an inch long, inserted in a moderate cavity; calyx in a shallow basin; flesh white, tender, mellow, and digestible, fine grained, slightly acid, moderately juicy, but not rich. A fine fruit, and very productive; tree very liable to be attacked by the borer.

Red Astrachan.—Originated in Russia; large fruit, round, conical; bright red with a bloom; acid flavor; flesh

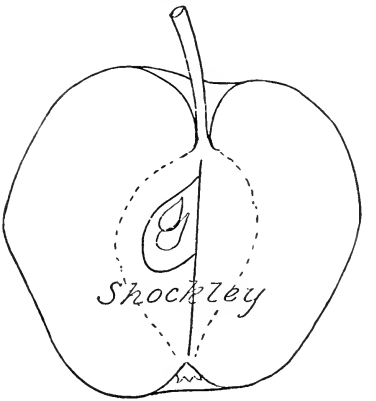


Fig. 179.

white; excellent market apple and good for cooking purposes. Tree is vigorous and productive. Ripens in early summer.

Romanite.—Small fruit; round conical; yellowish red in color; mild flavor and quality very good; suitable for the mountain regions. A good dessert apple. Ripens in late winter.

Rome Beauty.—Large apple, round conical; yellow with red stripes; flavor mild; juicy and fine grained. Ripens in autumn or late summer. The large and fine

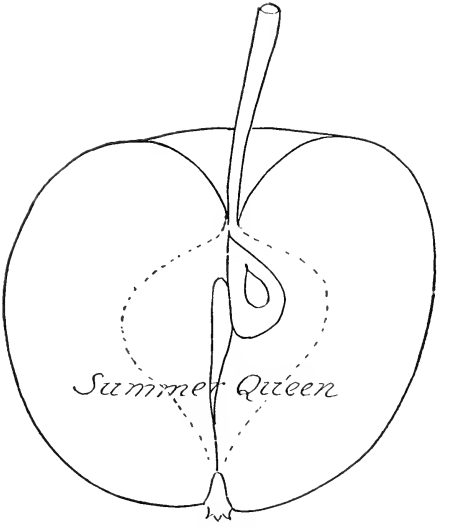


Fig. 180.

Fig. 181.

appearance of this apple makes it an excellent market variety.

SHOCKLEY (Waddel's Hall).—Fruit medium, roundish, oblong, narrowing to the eye; skin yellow, clouded, and striped with red, and with blotches of very dark-greenish russet; stalk long, slender, inserted in a deep, narrow cavity; calyx closed, set in a shallow basin; flesh firm; saccharine; of good second-rate flavor; ripe in October, and will keep till March.

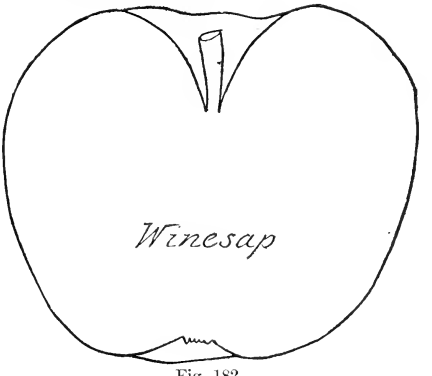


Fig. 182.

SUMMER QUEEN.—Large fruit, round conical; yellow, with red stripes; long stalk in small cavity; flesh yellow with an acid flavor. Ripens in summer. A good market apple.

STEPHENSON.—This apple originated in Alabama. Medium size, round oblong; yellow with red stripes; quality fair, with a mild taste; a good dessert and market apple, with excellent keeping qualities. The tree is vigorous and prolific. Ripens in late winter.

SORS OF WINE (Homony, Summer Queen of Kentucky). An average size, round; dark yellowish red; long stalk;

flesh white, mild in taste and good flavor. Ripens in summer. An excellent apple for market. Tree good bearer; prolific.

SMOKEHOUSE.—Originated in Pennsylvania, but a very popular apple in Virginia; rather large, round oblate; yellow with irregular red stripes; flesh yellowish white with a fine flavor. An excellent cooking and market apple. Ripens in late summer to autumn.

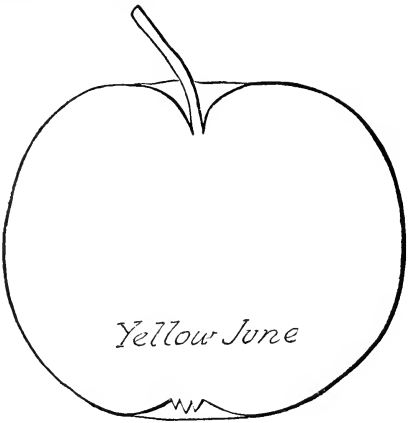


Fig. 183.

TAUNTON.—Originated in Alabama or Georgia; large apple, oblate conical; yellow with red stripes; acid flavor, and good quality; fine for market, and an open grower. Ripens in winter.

WATSON (Carolina).—Very large, oblate conical; green with red stripes; flavor and quality good. Ripens in summer. A prolific and profitable market fruit.

WHITE JUNEATING.—Quite a small apple, round oblate; yellowish red; good flavor; long, slender stalk in

a shallow cavity; suitable for cooking purposes. Ripens in summer. Productive.

WINESAP.—Medium size, round oblong; bright yellowish red; stalk slender and average length; flesh yellow, with an acid flavor. Ripens in late winter. Good market and dessert apple.

YELLOW JUNE.—Fruit medium size; form rather flat; stem short, in a deep cavity; calyx large and open, in a moderate basin; skin thin, and of greenish-yellow color; flesh yellowish, tender and juicy. An excellent variety,

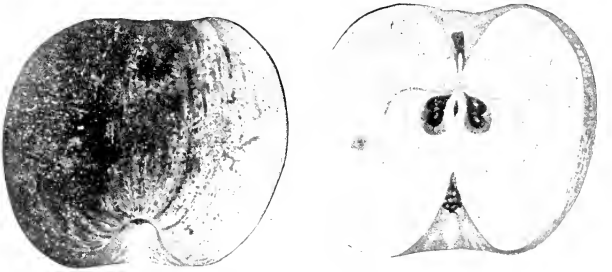


Fig. 184—York Imperial. Div. Pomology, U. S. Dept. Agri.

and worthy a place in every garden. Ripens from the 15th to the 20th of June.

YOPP.—Originated in Georgia. Large fruit; greenish yellow, with red; very good flavor and quality; prolific; bears young. Ripens in summer.

YORK IMPERIAL (Johnson's Fine Winter).—Large, oblate and oblique; yellow with red stripes; flavor good; flesh yellow, juicy. A fine shipping variety, which originated in Pennsylvania. Ripens in autumn.

YELLOW NEWTOWN PIPPIN (Albemarle Pippin).—Size medium to large, round oblate; yellow with a lively red cast; smooth with russet marks at the stem; flavor very

rich; flesh firm, crisp and juicy; highly fragrant. Ripens very late or in winter, and is an excellent dessert and market apple. It is grown to perfection in Albemarle county, Virginia.

The varieties of apples best adapted to the different sections of the South may be classified as follows:

Virginia.

SUMMER VARIETIES: Bough, Carolina, Early Harvest, Jefferis, Maiden's Blush, Margaret (Striped June), Red

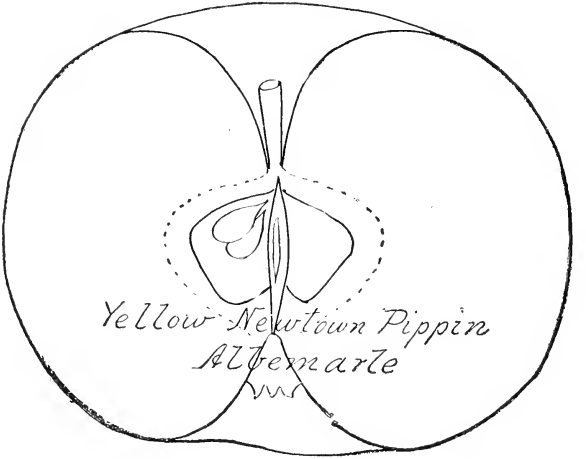


Fig. 185.

June, Red Astrachan, Smokehouse, Sops of Wine, Summer Queen, White Juneating.

AUTUMN.—Baldwin, Buckingham, Cullasaga, Fall Pippin, Rome Beauty, York Imperial.

WINTER.—Ben Davis, Jonathan, Limbertwig, Nickajack, Romanite, Shockley, Winesap, Yellow Newtown Pippin (Albemarle).

North and South Carolina and Georgia.

SUMMER.—Early Harvest, Family, Horse, Julian, Maiden's Blush, Margaret (Striped June), Red Astrachan, Red June, Sops of Wine, Summer Queen, Yellow June.

AUTUMN.—Buckingham, Carter's Blue, Disharoon, Meigs (Buncombe), Oconee, Rome Beauty, Taunton.

WINTER.—Ben Davis, Camak, Hockett, Mangum, Nickajack, Paragon, Romanite, Shockley, Stephenson, Yates.

Alabama, Mississippi, North Louisiana, West Tennessee, South Arkansas, and East Texas.

SUMMER.—Bough, Carolina Watson, Early Harvest (Northeast Alabama), Family, Horse, Julian, Margaret (Northeast Alabama), Rome Beauty (Northeast Alabama), Red Astrachan, Sops of Wine (Northeast Alabama), Summer Queen (Northeast Alabama), White Juneating, Yellow June.

AUTUMN.—Arkansas, Buckingham, Carter's Blue, Disharoon, Oconee, Taunton.

WINTER.—Camack, Hockett, Horn, Romanite, Shockley, Stephenson, Winesap, Yates,

East Tennessee and Kentucky.

SUMMER.—Early Harvest, Horse, Maiden's Blush, Margaret, Red Astrachan, Red June, Summer Queen, White Juneating.

AUTUMN.—Buckingham, Fall Pippin, Rome Beauty, York Imperial.

WINTER.—Ben Davis, Paragon, Winesap.

Texas.

SUMMER.—Bough, Red Astrachan, Red June, Horse.

AUTUMN.—Black Twig, Fall Pippin, Rome Beauty, Buckingham.

WINTER.—Ben Davis, Jonathan, Nickajack, Meigs, Paragon, Shockley, Winesap.

Florida and South Louisiana.

SUMMER.—Red Astrachan, Jennings.

Gathering the Fruit.—Apples intended for keeping, or sending to market, should be carefully picked from the tree, and handled with care, to prevent bruising. Those that fall of themselves must be kept separate, as the least bruise will cause decay. They must be frequently looked over, and every one the least decayed must be removed, or it will infect the others. They should be kept at a uniform temperature, in a dry, cool situation. Choice specimens may be wrapped in absorbent paper, and laid singly on shelves. They should not be exposed to much frost, and still less to extremes of heat. Specimens may thus be kept in good condition until March. A fruit room should be kept as cool as possible, and if the temperature could be uniformly at 32 , no decay would take place.

In selecting varieties for cultivation, preference should, as far as practicable, be given to those of southern origin. Of northern varieties, those classed as summer apples succeed very well here. Some of the early autumn varieties also do well, and, of course, are summer apples with us. But the winter apples, as a class, are entirely unsuited to the Southern States. The last few years have developed, with us, a very large number of as choice and beautiful varieties of winter apples as can be found anywhere, so that we can have an abundant supply during the entire year.

MARKETING.—It does not pay to ship inferior fruit of any character, and this is especially true with apples, where there is such great competition. Store the apples for a short while in order to give them an opportunity to shrink and sweat. By this method the inferior grades will become more evident. Use barrels of the best make;

it is poor economy to ship in poor barrels. Pack carefully, shaking now and then to insure the thorough settling of the fruit, thus making a compact safe package. "Every barrel should be faced, but the facing should be properly done, in order to make the barrel look attractive, but not to deceive. The object of this facing is to have two flat layers at the top, stems upward. Select nice, bright, smooth fruit for the purpose, but the size of the apples used for facing should be an accurate indication of the average size of the entire contents of the barrel. The facing is done first in packing the barrel, the first two layers being put in the bottom, stems down, this becoming the top when open. The head is best put in with a screw press. When practicable, apples should be packed by an experienced workman. The stencil marking should be placed on the top, the stenciling carefully done, and the variety plainly indicated. The neat appearance of the barrel often makes quite a difference in the price obtained. Stenciling should always be done on the faced end, as it marks the top, which commission merchants always open." (Farmers' Bulletin 62.)

APRICOT.—*(Prunus Armeniaca.)*

The Apricot is a fruit somewhat resembling both the plum and the peach. The tree is ornamental as well as useful; larger than the plum, with glossy, heart-shaped, large leaves and white blossoms, which appear so early that they are usually killed by spring frosts. But, as with the nectarine, the great obstacle to its culture is the curculio, which may be treated as in the case of that fruit. In favorable seasons the apricot is very productive. The apricot is a native of Armenia and other parts of Central Asia. In quality, it is second only to the peach, but, coming earlier, it is very acceptable.

For jellies, tarts, and preserving in brandy or sugar, it is much esteemed, and is excellent when dried as directed

for the peach. The apricot is generally budded on the plum stock; it is sometimes propagated on its own root, and also upon the peach. The plum is the hardier stock, and makes the better tree. It may be root-grafted on the Chickasaw plum. Those propagated by seed are usually very hardy and productive. On the peach stock, the tree is liable to be destroyed by the borer, and the fruit is inferior.

Apricots are apt to bloom so early in the spring that it is best to plant them in a northern exposure, where they will be retarded in blooming; by the side of a building there is less danger of frost. It is just as necessary to shorten in the young branches of the apricot as those of the peach.

The best soil is a deep loam; cultivate and manure the same as the peach. The hardiest apricots are the Dubois, Early Golden, Orange, and Breda.

Dubois or Early Golden.—Fruit small, roundish oval; pale orange color, moderately juicy, sweet and good; very productive and hardy. Ripens June 10th.

Large Early.—Fruit medium size, oblong and compressed; suture deep; skin slightly downy, pale orange in the shade, ruddy in the sun; flesh yellow, and separates from the stone, rich and juicy; kernel bitter. Ripens June 10th.

Orange.—Fruit medium, roundish, with suture hollowed at the stalk; skin orange, with a ruddy tinge; flesh dark orange, rather dry, and somewhat adhesive to the stone, which is small and roundish; kernel sweet; not first rate, but good for pies and tarts, preserving or drying; a good bearer. Ripens June 10th.

Peach.—Fruit very large, roundish; sides compressed, and with a distinct suture; skin yellow, but deep orange, mottled with brown, in the sun; flesh deep yellow, rich and delicious; the best variety in cultivation; stone rough. Ripens last of June.

BREDA.—Small, roundish; color deep yellow, darker in the sun; flesh deep orange; high flavored, rich and juicy, separating from the stone; kernel sweet; a native of Africa; hardy, productive and fine for the dessert or preserves. Ripens middle of June.

MOORPARK.—Large, roundish oval; skin orange, with a ruddy cheek; flesh bright orange, free from the stone, juicy, and of rich, luscious flavor; stone perforated; hardly differs from the peach apricot, not quite so large, and a little later. Ripens July 20th. Very productive.

HEMSKIRKE.—Fruit large, roundish, but considerably compressed on its side; skin orange, with a red cheek; flesh bright orange, tender, rather more juicy than the Moorpark, with a rich, luscious flavor; stone small and kernel bitter. Ripens July 1st.

ROYAL.—Fruit round, large, slightly compressed; skin dull yellow, with a darker cheek, faintly tinged with red; with a slightly marked suture; flesh pale orange, firm and juicy, with a rich, vinous flavor. Ripens July 1st.

MUSCH.—Fruit average size, round; skin yellow-orange. Ripens in middle summer. Grows successfully in Alabama and Georgia.

SANTA FE.—This fruit originated in Florida, and is one of the best apricots for the extreme South. Flowers begin showing late enough to avoid danger from frosts, and matures fruit the last of May or first of June. Fruit medium size, yellow with red-brown dots; flesh light yellow; quality best; freestone.

HUBBARD.—Named in honor of ex-Governor Hubbard, of Texas, who imported it from Japan. Succeeds well in Texas and Louisiana. Fruit rather large; yellow in color and good flavor.

BUNGO.—A Japanese apricot; fruit bright yellow and good quality.

(486) Plate 6—Banana Plant and Fruit. Photo. by O. P. Havens.

BANANA.—(*Musa sapientium.*)

Several varieties of this fruit have been in cultivation throughout Florida and along the coast of South Carolina, Georgia, Alabama and Louisiana for many years. But, like all other sub-tropical fruits, it attains its best condition in growth and perfection of fruit far south in Florida, some bunches containing as many as 200 bananas.

The varieties in general cultivation in Florida are:

BARACOA.—The red Jamaica variety, with large fruit, good quality and red in color. This is the ordinary commercial variety.

CAVENDISH.—Also known as "Dwarf," "Chinese," "Martinique" (*M. Cavendishii*), medium size, yellow and excellent quality of fruit; a dwarf species.

GOLDEN.—Fruit large, yellow and of good quality.

These three are the best market varieties.

HART'S CHOICE (*M. orientum*).—Ranges farther north than the Baracoa, Cavendish or Golden. Small growth; sometimes called fig banana; quality excellent; yellow in color. Ripens sooner than other varieties.

ORINOCO OR "HORSE" BANANA (M. *paradissica*).—Hardy, and grows farther north than any other variety; quality of fruit fair; large and yellow in color.

The banana is propagated by suckers or offsets. When the fruit ripens the plant dies down to the ground, and several shoots afterwards put forth from the roots. All of these should be cut out and transplanted except two or three of different ages, which, when they grow to maturity, will ripen their fruits in successive years. In transplanting the offsets or suckers the land must be well prepared and holes about two feet deep dug and an ample supply of fertilizer containing potash and

vegetable mould added. Ashes and stable manure are excellent. The rows are run nine feet apart, and the plants are placed in these rows eight to nine feet apart, each plant opposite the vacant space in the next row.

MARKETING.—The banana is sold to the fruit-dealer on the bunch. The shipment is made either in barrels or barrel-crates, with the fruit packed in straw, or placed snugly in fruit-cars, when shipped in large quantities to one dealer, with each bunch wrapped with straw or paper to protect from bruising.

THE BLACKBERRY.—*(Rubus villosus, etc.)*

The Blackberry is a tolerable dessert fruit, being used for tarts, pies, puddings, jams, and preserves. It continues a long time in bearing, and the fruit may be dried for winter use. A very good wine is made from the juice, which more nearly resembles Madeira than any made from our native grapes. There is a white variety, which differs from the black only in color, and is occasionally found growing wild amongst the black.

Fig. 186—Early Harvest Blackberry. One-half size.

Fig. 187—Wilson's Early Blackberry. Average size.

Although the blackberry grows in profusion in almost every old field throughout the South, still it is greatly improved in size and quality by careful cultivation and selection. The following varieties are recommended:

EARLY HARVEST.—This is very productive and very sweet; valuable for an early crop.

Fig. 188—Kittatinny Blackberry (after Bailey). Cornell Experiment Station Bulletin 99.

KITTATINNY.—A large fine flavored fruit (Berckman's), ripening in June. The plant is erect.

WILSON'S EARLY.—Plant trailing; fruit very large and sweet, prolific and begins ripening in May.

DALLAS.—Originated in Texas and is popular in that State.

THE DEWBERRY (comprising both *Rubus Canadensis* and *trivialis*) is also very common at the South; is running or trailing, and ripens its fruit some two weeks in advance of the high bush varieties, and the fruit is sweeter.

There are several cultivated varieties, the best of which are DOWNING'S, STUBBS', AUSTIN, and LUCRETIA. The last-named has a large, very sweet fruit of excellent quality. If the plants are attacked by fungi and insects use the spraying formulae given elsewhere in this book.

MARKETING.—Care must be exercised in packing, because of the tender fruit. Pick before quite ripe and pack in 24 or 32-quart crates.

CHERRY.—(*Cerasus.*)

The Cherry, it is said, was brought from Asia by Lucullus, the Roman general; and from Rome its culture spread over Europe. In cooler latitudes some of the varieties are quite ornamental on account of their fine foliage and early white blossoms, but it stops growing and drops its leaves too early in our climate to be esteemed for this purpose.

In the Southern States but few varieties succeed well, except the common Morello or Pie-Cherry. The trees of the finer varieties grow very well for some three or four years, and then commence splitting and dying on the southwest side of the trunk. We have seen a few that grew and bore fine crops for a few years when planted on the top of poor, rocky hills. The splitting of the bark appears to be caused by a too luxuriant growth. The trees should be planted in poor ground, and have but little or no manuring. Train the trees with low heads, so as to shade the trunks and protect them from the

sun. Cherries are generally grafted or budded on the Mazzard or wild European stock, though the Mahaleb or Perfumed-cherry stock is preferable, as it dwarfs the tree, and is less liable to split and sun-burn.

It is not probable that the finer varieties of the Cherry will ever be very successfully cultivated at the South until we raise seedlings suited to the climate.

Of the varieties described below, the Elton, May Duke,

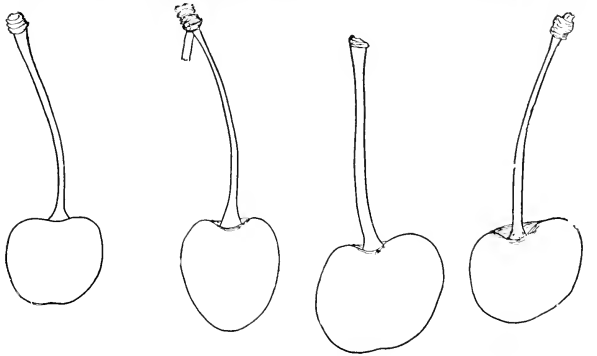


Fig. 189.

Sweet Montmorency, and common Morello are the only ones that have ever produced good crops with us.

Cherries are divided into two groups or species—*Cerasus avium* and *C. vulgaris*. The first are called "Heart and Bigarreau," and the second species are known as "Duke and Morello" cherries.

Heart and Bigarreau Cherries.—Fruit sweet, tender and heart-shaped. The plant grows to the height of a medium-sized tree, with spreading branches and drooping leaves. The varieties best known are:

Black Heart.—Large, heart-shaped; skin glossy, dark purple, changing to black when ripe; stalk one inch and

a half long, in a moderate cavity; flesh half tender, juicy, and of a rich, sweet flavor. A large, hardy tree, but disposed to split.

DOWNER.—Fruit medium, borne in clusters, roundish heart-shaped, inclining to oval; skin smooth, of a soft, lively red color, mottled with amber in the shade; flesh tender, melting, with a sweet, luscious flavor.

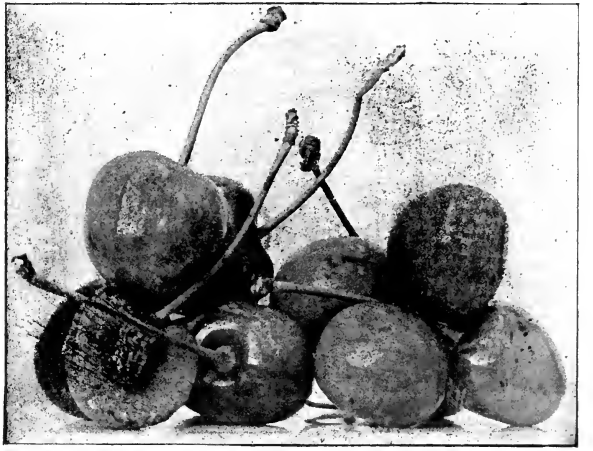


Fig. 190—Cherry. Napoleon (after Bailey). Cornell Experiment Station Bulletin 98.

ROCKPORT.—Very large, heart-shaped; skin deep red on amber ground; flesh pale yellow, fine, juicy, with a sweet, rich flavor. Splits at the South.

ELTON.—Very large, heart-shaped; skin pale yellow, with a mottled red cheek; stalk long and slender; flesh firm at first, becoming tender, juicy, with a rich, luscious flavor. Tree grows slowly, and is not disposed to split. Ripens May 20th to June 1st.

KIRTLAND'S MARY.—Very large, roundish heart-shaped; color light and dark red, mottled on a yellow ground; stalk of moderate size; flesh light yellow, half tender, rich, juicy, with a sweet flavor.

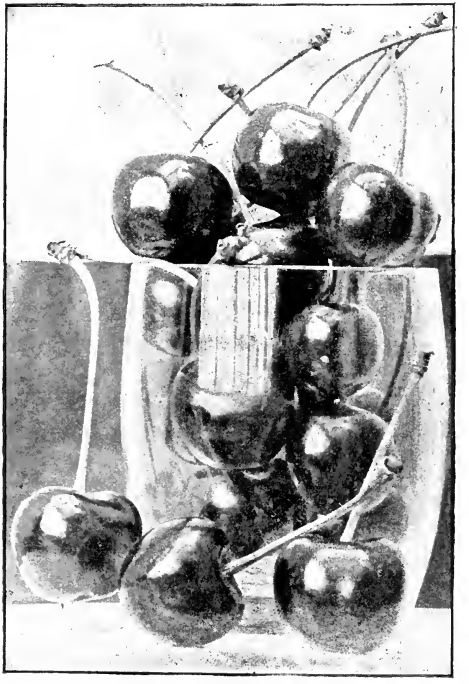


Fig. 191—Cherry. Black Tartarian (after Bailey). Cornell Experiment Station Bulletin 98.

NAPOLEON (Royal Ann).—Large, heart-shaped; color yellowish-red; stem long; flavor fair, but not first class; flesh firm; a good shipping cherry. Ripens rather late.

BLACK TARTARIAN.—Very large, heart-shaped; color black; stem long; flavor rich and pleasant. Ripens early. This is a general favorite.

Duke and Morello Cherries.

The fruit with these cherries is usually acid or subacid, tender and pleasant. Trees are more bushy than the Hearts, and the plants are somewhat smaller. The varieties are as follows:

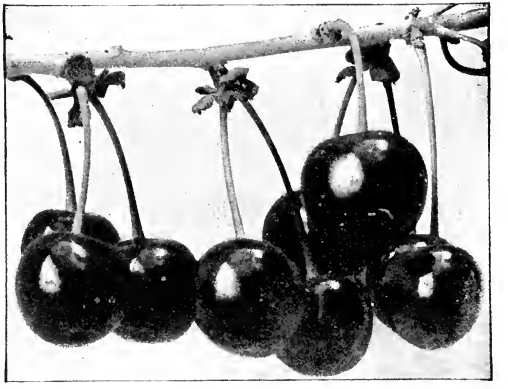


Fig. 192—Cherry. English Morello (after Bailey). Large Morello. Dutch Morello. Donald's Morello. Cornell Experiment Station Bulletin 98.

REINE HORTENSE.—Fruit large, bright red, tender, juicy, nearly sweet, and delicious. Tree grows vigorously, bears well, and if planted on poor ground is not inclined to split. An excellent fruit.

BELLE MAGNIFIQUE.—A large red cherry; rather acid, tender, juicy, and rich; fine for cooking, and for dessert when fully ripe. Tree of slow growth, but bears profusely.

ENGLISH MORELLO.—Tolerably large, roundish, nearly black; flesh reddish-purple, tender, juicy, of a pleasant subacid flavor. The common Morello of this country is smaller and inferior to the above. Ripens May 20th.

PLUMSTONE MORELLO.—Large, dark red, rich and fine flavor; the best of all Morellos. Tree slow grower, and has small, wiry shoots.

SWEET MONTMORENCY.—Fruit of medium size, round, and a little flattened; skin pale amber in the shade, light

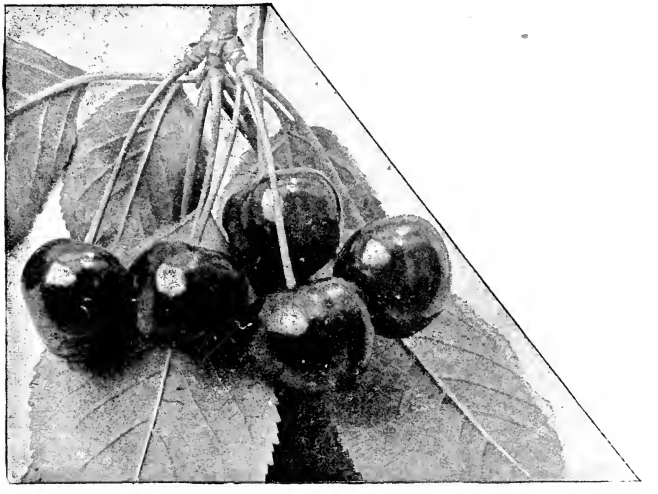
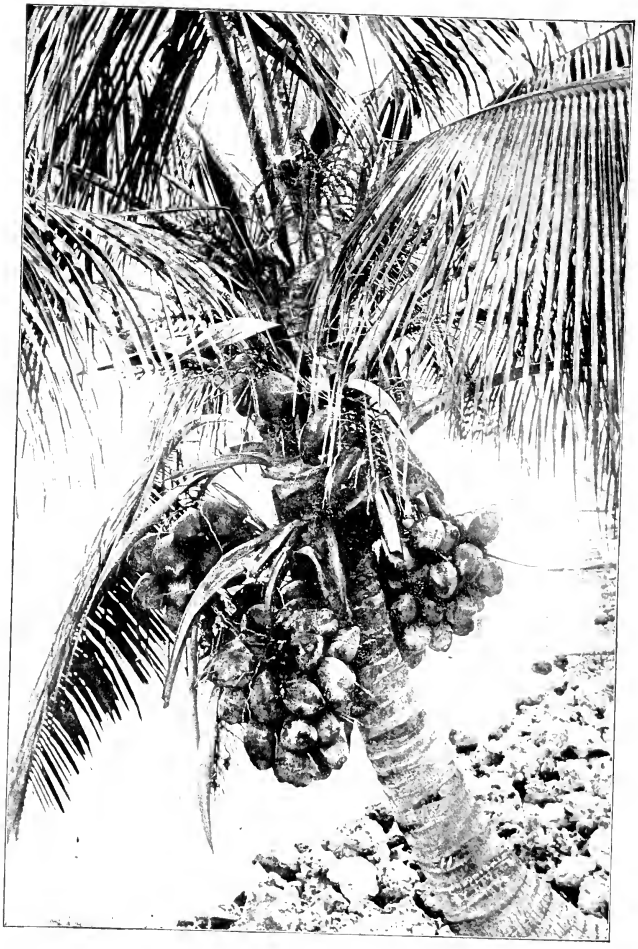


Fig. 193—Cherry. May Duke (after Bailey). Cornell Experiment Station Bulletin 98.

red, slightly mottled in the sun; stalks long and slender, inserted in a small, even depression; flesh yellowish, tender, sweet and excellent. One of the best at the South.

MAY DUKE.—Fruit roundish, medium size, and in clusters; skin lively red at first, dark red when ripe; flesh



(496) Plate 7—Cocoanut Palm.

reddish, tender, melting, very juicy; rich and excellent when fully ripe. Ripens early in May.

EARLY RICHMOND OR KENTISH.—Fruit small to medium, round, a little flattened; grows in pairs; skin bright red, growing dark when ripe; stalk one and a fourth inch long, stout, and set in a pretty deep hollow; flesh melting, juicy, and of a rich, sprightly flavor. A hardy variety and excellent for cooking.

LATE KENTISH.—Resembles the above, but is two weeks later; a little larger and excellent for cooking, preserving and drying.

MARKETING.—The 24-quart crate is suitable for this fruit when shipped in quantity. The best varieties, however, may be shipped with profit in the climax basket.

COCOANUT.—*(Cocos nucifera, Linn.)*

This plant is propagated by seed. The nuts are placed in holes one and a half to two feet deep, partly covered with earth, and as the seedling grows the hole is gradually filled until the surface is reached. The seedlings are transplanted to the field where the trees are to permanently grow, and set out twenty-five or thirty feet apart. They will begin fruiting, under favorable circumstances within seven years, and will continue bearing nuts for more than sixty years. These nuts grow in bunches, with five to fifteen in each bunch, and a well-grown tree will produce from eighty to one hundred nuts each year. The cocoanut is peculiarly adapted to the coast of South Florida, and extensive plantations are to be found in that portion of the State. But little attention has been devoted to developing varieties.

CURRANT.—*(Ribes.)*

The currant is a low shrub, a native of Great Britain and the northern parts of Europe and America; with

smooth branches, doubly-serrate, pubescent leaves, and yellowish flowers, which ripen early in the spring. The fruit ripens with the later strawberries and raspberries. It succeeds and thrives admirably in our mountain sections, and will live and bear tolerably well here in a cool northern exposure, but would probably die the first season near the sea-coast.

The fruit is of an agreeable acid taste; when ripe it is used with sugar for dessert, and also alone, or mixed with raspberries, for jams, jellies and wine. It is used both green and ripe for stewing, tarts and pies. In cool climates it is the most easily cultivated and useful of small fruits.

The currant is propagated from cuttings, which should be planted in the fall in a shaded place, but not under trees; the north side of a plank fence is an excellent situation, provided it is open to the morning sun.

The currant requires a moist, rich soil, and should be trained as a bush. All the pruning it requires is to cut out the superabundant old wood, and to shorten that of the last season's growth.

There are two species of the currant—*R. nigrum* and *R. rubrum*. The *Naples* variety of the first species has been grown with some degree of success in Georgia, South and North Carolina and Texas. The following varieties of *R. rubrum* were cultivated by Mr. White in Athens, Georgia, with success, and are recommended:

Red Dutch.—Fruit of large size, oblate, borne in clusters, and less acid than the common red; color fine transparent red.

White Dutch.—Large, yellowish-white, less acid than the red varieties.

We could describe several other varieties, but not having had any success with them, we only give those with which we have succeeded.

The following additional varieties are recommended by the Division of Pomology as suitable for North and South Carolina and Georgia: CHERRY, FAY, VERSAILLAISE, VICTORIA, and WHITE GRAPE. The Cherry, Fay, and White Grape are especially desirable in Eastern Texas.

MARKETING.—It is customary to send this fruit to market in 24 or 32-quart boxes.

THE FIG.—*(Ficus Carica.)*

The Fig is a large shrub, or a low, spreading tree, according to the manner in which it is trained. Some varieties grow to the height of twenty or thirty feet, in favorable localities, but it generally does not reach above half that height. The leaves are large, cordate, and deeply sinuate, with three to five lobes, thick and pubescent on the under surface. The blossoms are not apparent, but concealed in the inside of the fleshy receptacle that becomes the fruit, which consists of a pulp, containing numerous pericarps enclosed in a rind, which becomes variously colored in the different varieties. Though the fruit is too sweet and luscious for those unaccustomed to it, with use it soon becomes a great favorite, and is perhaps the most wholesome and nutritious of fruits. The fig is a native of Asia and Africa, and has been cultivated from the earliest times. It is perfectly at home in all the low country and middle portions of the Southern States, and as universally cultivated below the mountain section as the peach. Large quantities of dried figs are imported into the United States, and are even sold in our own section. At very little expense, they could be put up at home and even exported at a profit.

A good way to dry figs is to gather them when perfectly ripe, and boil them in a preserving kettle in a syrup of nice sugar about five minutes. Take them out,

dry them in a warm oven, or a kiln made for drying fruits. When dry they can be packed in drums or boxes.

Imported figs are dipped in a hot lye made of fig wood ashes, and dried on frames in the sun; when dried here they are apt to be infested with minute insects. The fig is readily propagated by shoots, or cuttings from the roots, planted in the fall or spring. Cuttings should be eight or ten inches long, and include a small portion of old wood at the base of each; if planted in a hot-bed in January, they will make handsome plants the same season. Figs should be planted twelve to fifteen feet apart in good, rich earth. The Celestial Fig is best trained as a low tree. The best soil for the fig is a mellow loam of a calcareous nature.

Ashes, marl, or composts prepared with mild lime form the best manure. If the soil is too moist the fig continues its growth too late in the fall, when the new wood is killed by the frost; while young, it is best to protect the tree during winter with branches of evergreens. I have found that young trees will mature their fruit and wood much more perfectly and better endure the winter, if the young shoots are broken off at the ends, and if all fruit forming after that is removed, and no more growth is permitted after the middle of September.

As a general rule, however, with the fig, the more it is pruned the less is the crop. This does not apply to root pruning.

If from too rank growth of wood the tree drops its fruit, cut off all the roots that project more than half the length of the branches. This may be done at any time during winter.

Dark-Colored Varieties.

BRUNSWICK.—Fruit very large, long, pyriform, with an oblique apex; eye depressed; stalk short and thick; skin

pale green, tinged with yellow in the shade, dull brownish-red in the sun, and sprinkled with pale brown specks; flesh reddish-brown, pinkish at the centre, semi-transparent, rich, sweet, and high flavored. Wood of strong growth, and very hardy.

BROWN TURKEY.—Fruit large, oblong or pyriform; skin dark brown, covered with thick blue bloom; flesh red and delicious. Said to be very hard and prolific. This is one of the best varieties grown.

BLUE GENOA.—Leaflets narrow, and the leaf seven-lobed; fruit large, long, obovate, tapering to the stalk, which is slender; skin almost black, glossy, covered with purple bloom; flesh bright red, of excellent flavor. This continues to bear fruit abundantly until frost, and, like the Brunswick, is indispensable.

CELESTIAL.—Fruit quite small, pyriform; stalk slender; skin very thin, dark colored, and covered with purple bloom; flesh light red, and of delicious flavor.

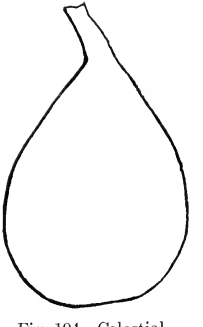


Fig. 194—Celestial.

In dry weather the fruit hangs on the tree until it shrivels, improving in sweetness and flavor. Trees grow quite large, and are very productive, yielding constantly from July to October. Leaves five-lobed. Very hardy.

White, Yellow, and Green Varieties.

LEMON WHITE, OR COMMON WHITE.—Fruit turbinate, flattened; stalk short; skin pale yellowish-green; flesh white and sweet, not high flavored. Ripens quite early, and is a good bearer. Its color renders it a favorite for preserving.

The following additional varieties have also been found to be especially desirable figs: GREEN ISCHIA (White Ischia or White Italian), BLACK ISCHIA.

MARKETING.—The usual method of shipping the fig is

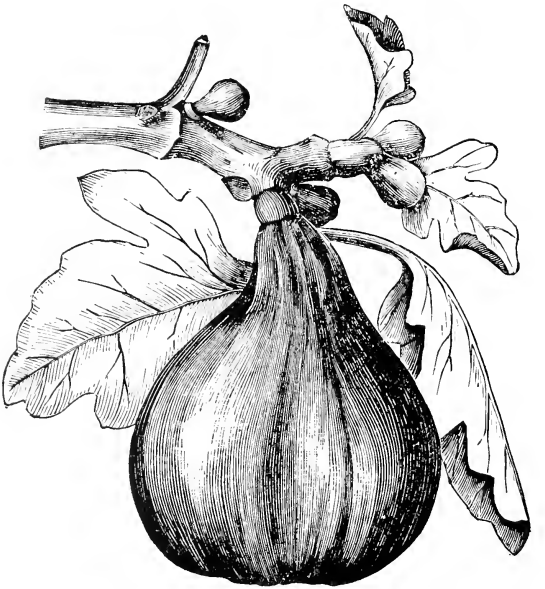


Fig. 195—Lemon Fig.

in the dried form, packed in small fig boxes. The plan for drying is given above.

GOOSEBERRY.—*(Ribes oxyacanthoides.)*

The Gooseberry, like the Currant, is a native of Europe. Green, it is used for pies, tarts, and puddings; ripe, it is a very agreeable dessert fruit. It is more impatient of

heat than the currant, and cannot be expected to thrive except among the mountains. It is like the currant, propagated from cuttings, likes the same soil and treatment generally, even in the Northern States, and in our mountain region the fruit is liable to mildew, the foreign varieties being much more subject to it than the native varieties.

Houghton's Seedling, Downing's Seedling, Pale Red, and Red Jacket are the best native varieties we have seen. Champion is recommended by the Division of Pomology as especially desirable in Eastern Texas. Chautauqua, of the *Grossularia* species, has also been grown successfully in Eastern Texas. Woods' earth, or leaf mould, and ashes, are the best manures for both the currant and gooseberry that we have tried.

MARKETING.—Pick green, but when fully grown, before the coloring of the ripe condition begins to show. Pack in baskets.

THE GRAPE.—(*Vitis.*)

The vine was one of the first plants brought into cultivation. The foreign grapes are all varieties of *Vitis vinifera*, and came originally from Asia. Of native grapes, we have *Vitis Labrusca*, of which Isabella, Catawba, Concord, Diana, Hartford Prolific, and many others, are varieties; *Vitis Bourquiniana* and *V. aestivalis*, which include the wild Summer and the Frost Grape. Of the cultivated varieties, the Herbemont, Lenoir, and others of the same class; *Vitis rotundifolia*, which includes the wild Muscadine, or Bullace, of the South, and the Scuppernong.

Our American grapes are seedlings from the wild varieties, removed some one, two, and three generations from the original type. Foreign grapes do not succeed in our climate in open air or out-door cultivation. All the foreign

varieties do well both North and South, in cold graperies, under glass.

The grape is a cooling and refreshing fruit of the highest excellence; green, it is used for pies and tarts; when ripe, it is a nutritious and most delicious dessert fruit, and is also used for preserving and jellies. The dried fruit, or raisins, are employed extensively for the dessert, and in many preparations of cookery. The leaves are an elegant garnish to other table fruits. But the chief product of the grape is wine, which is superior to that made of any other fruit.

Large quantities of wine are now made in the United States, more especially in California, where most of the foreign varieties succeed. In the Southern States vineyard culture has proved a failure with all derived from the Labrusca and Aestivalis species. After one or two fair crops the vines become stunted and unfruitful, or if stimulated by extra culture and manuring, both vines and fruit mildew and rot. There are but very few varieties which can be depended upon with anything approaching certainty.

Since the great development in the methods of spraying and treatment of fungus diseases, the statement made by Mr. White in the last paragraph must be considerably modified. Many varieties of the *V. Labrusca* have been tested during the past ten years by the agricultural experiment stations in the South, and the results have been highly satisfactory. Mr. White made the above statement more than forty years ago, when our knowledge concerning fungus diseases and their treatment was exceedingly limited, but since the establishment of the experiment stations so much activity has been manifested among the botanists and horticulturists to overcome fungus and insect attacks on the grapes, many of the varieties which failed during Mr. White's day are now

being successfully grown in many of the prominent vineyards throughout the South. For spraying formulae and methods of application the reader is referred to the chapter devoted to that subject.

The grape is planted by the vine-growers on level ground, in rows ten feet apart and eight feet in the row, but on hillsides a less distance may be adopted. The vine-

Fig. 196—Catawba Grape.

yard is laid off with a line, and a stake put down where each vine is to grow; then a broad hole, a foot deep, is dug, in which are placed two cuttings, six or eight inches apart at the bottom, in a slanting position, but with the top eyes only about an inch apart, and even with the surface. Throw in a shovelful of well-decayed leaf mould, that the cuttings may strike freely. Cover with an inch of charcoal dust, or light mould, when the cuttings are planted. The cuttings should be short-jointed and well

ripened, each cutting having about four eyes, or buds. Cut them off close to the lower joint, and about an inch above the upper. The earth should be pressed closely about the cuttings. The best time for putting them out is the last of November or December. The finest vines are raised from cuttings planted where they are to remain. Being undisturbed by removal, they are more thrifty and long-lived. Remove all the cuttings but one, if more than one succeeds, and use them to replace where others have failed. During the summer, keep the ground clean and light, by repeated hoeings, and pull off superfluous shoots, leaving but one or two to grow at first, and one eventually.

In fertilizing the grape the fact must be borne in mind that the plant requires a large per cent. of potash and phosphoric acid, and, during the fruiting season, a small application of nitrogenous manure may be applied; not enough, however, to cause a too rapid development of canes to the detriment of the fruit-bearing powers. Mr. Starnes, the horticulturist of the Georgia Experiment Station, recommends the following formula for a good grape fertilizer:

Cotton-seed meal	1,000 pounds.
High-grade acid phosphate	500 pounds.
Kainit	500 pounds.
	2,000 pounds.

"The fertilizer should be used at the rate of two pounds per vine—one-half the amount, or one pound to be mixed with the second layer of dirt excavated from the holes. This pile or mound being used to fill the holes after the top soil has been sifted around the roots of the plant, the fertilizer does not come into immediate and direct contact with the young rootlets; but as it becomes soluble is carried down in a dissolved and assimilable state. The rest of the fertilizer should be applied interculturally at

the time of either the first or second working—preferably the latter. Drill it on both sides of the row with a fertilizer horn, covering with a cultivator or scrape.

"The formula for the second year might be appropriately constructed as follows:

Any standard, complete fertilizer	100 pounds.
Cotton-seed meal	30 pounds.
Kainit	50 pounds.
Acid phosphate (high grade)	20 pounds.
	200 pounds.

"The third year the vines will come into bearing, and the object of the grower from this time on will be to obtain fruit, not wood. This latter will take care of itself. Phosphoric acid and potash must be supplied in abundance, and hence for a permanent formula for the third and subsequent years it will be well to use the following:

High-grade acid phosphate	900 pounds.
Kainit	900 pounds.
Cotton-seed meal	200 pounds.
	2,000 pounds.

"The above is a low-grade fertilizer and should be applied as before, at the rate, however, of three pounds per vine, instead of two."

The training and pruning of the grape vine are essential to perfect fruit development and convenience in gathering the crop. There are excellent works in existence fully devoted to this subject, and which explain clearly the *modus operandi*. The reader is advised to study such books if a vineyard of large dimensions is contemplated; but, to assist those persons who have not the opportunity to examine such works, and who desire to grow grapes on a limited scale, the following general instruction is given. The material used in the preparation of what follows on pruning and training has been

liberally drawn from the writings of Professor E. G. Lodeman, late horticulturist of Cornell University Experiment Station; Professor L. H. Bailey, of the same institution, and Mr. Hugh N. Starnes, horticulturist of the Georgia Experiment Station.

For a better understanding of the terms used the following definitions are given:

Shoot.—The growth of wood less than one year old.

Cane.—Mature shoots of one year's growth.

Arm.—Mature wood stems of three years' and more growth.

Spur.—A shortened or pruned cane, generally bearing only from one to four buds.

"The operation of pruning the vine is performed for the sole purpose of removing such wood as will not bear, or such as is supposed to interfere with the production of the finest crop of fruit that the plant is able to mature. Its primary object, therefore, is to reduce the amount of bearing wood, and thereby thin the fruit so that the roots of the vine are not taxed beyond their capacity.

"All the fruit is, of course, borne upon the shoots which grow from the buds now found upon the canes; the canes, therefore, must be removed, and not the older wood, for the latter serves as the framework upon which the canes are maintained.

"In cutting away the canes, all wood which has not properly matured should be removed, and those shoots which have made an excessive growth, forming 'bull canes,' are also undesirable. The medium-sized, short-jointed, and well-matured wood is to be preferred, and such wood only. Yet some of this well developed wood must also be sacrificed, until the amount allowed to remain upon the plant is reduced to the proper proportion. Assuming that the plant can mature the fruit produced by twenty-four buds (the number of buds left may vary

from two to fifty or more), about thirty buds could be allowed to develop. These should be uniformly distributed according to the system of training employed; they may be left upon five canes, each cane having six buds, or the distribution may be varied according to circumstances. But such is in general the method adopted in the vineyard for estimating the proper amount of bearing wood to leave upon each cane. As a result of such systematic pruning, the fruit from the vine is larger and more fair; it is also produced more regularly, since the maturing of too heavy a crop weakens the vine so that it is unable to mature even an average amount of fruit the following year. A vine properly pruned and fertilized should bear about the same amount of fruit each year from the time it comes into full bearing. A secondary benefit derived from pruning is the reduced stature of the plant. This allows more vines to be set upon a given piece of land, and it enables the work of cultivating, spraying and harvesting to be performed much more easily and profitably.

"Training, on the other hand, is almost wholly a matter of convenience. It does not affect the strength of the vine or the value of the crop in any essential particular. The training of a vine refers to the disposal or arrangement of the various parts of the vine after pruning has taken place. The method of training adopted determines the operator to leave certain growths in certain portions, not because more or better fruit is expected, but for the reason, perhaps, that the fruit may be harvested with greater ease; that a laborious operation may be wholly dispensed with, or that there may be less danger to the maturing crop from the winds or other natural agencies. The method of training adopted by a vineyardist is largely the result of personal preference, or of education, although soil and variety are important factors in the

selection of the system. The health and vigor of the vines are rarely affected by the method in which it is trained, and although some system of training must be adopted in every vineyard, still altogether too much weight has been laid by most horticultural writers upon the particular merits of the various systems, while the actual ruinous effects of bad pruning have not always been sufficiently emphasized. A vine properly trained is desirable, but a properly pruned vine is essential to the highest success.

"1. The amount of fruit which a vine can bear and mature in the highest perfection is limited; when this limit is exceeded the fruit deteriorates.

"2. Upon the fruit the effect of overproduction is to reduce the size of the berries and of the clusters, and probably also to impair the quality; the vines make a poor growth, the foliage is small, and the vigor of the plant is generally reduced. When a vine has been allowed to overbear, especially when it is young, years may sometimes be required before a vine returns to its normal condition.

"3. A plant which is carrying less fruit than it is capable of maturing generally produces a very heavy foliage and an excess of wood.

"4. All the fruit of the vine in any one year is borne upon the shoots of that year, which grow from the canes produced the preceding year; and since the number of clusters borne upon a single shoot is fairly constant (varying generally from one to three), the number of buds left upon a vine when it is pruned, determines with considerable accuracy the number of clusters which the vine will possess. Usually more buds are allowed to remain than would be safe if each one were sure to be perfect.

"5. The position of the bearing wood upon a vine is of secondary importance as regards the effect upon the

quantity and quality of the fruit; but as a frequent change or renewal of the entire top of the vine appears to be desirable, the young bearing wood should be as near the root of the plant as circumstances will allow. When the important relation of these essential points to successful grape growing is thoroughly considered, the secondary character of training of the vine becomes apparent."

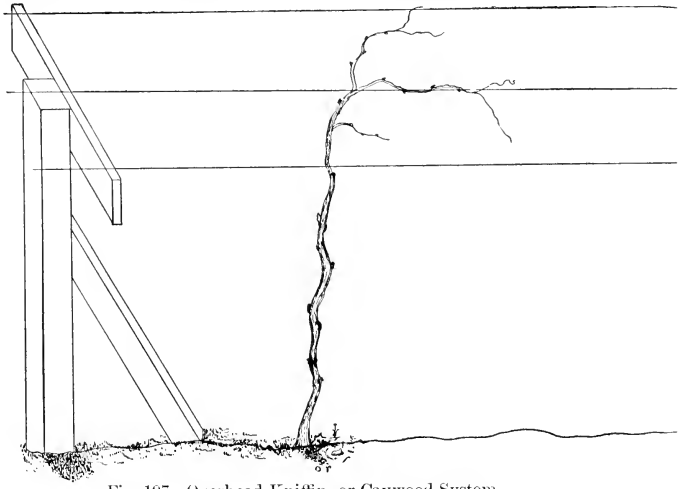


Fig. 197—Overhead Kniffin, or Caywood System.

There are many systems of training the vines, all of which may be grouped into three classes, depending upon the direction in which the shoots are made to grow.

1. The upright system.
2. The pendant, or drooping, system.
3. The horizontal system.

The first, or upright system, is well illustrated in the method adopted in some sections of the South, where the

Fig. 198—Horizontal Arm Spur System.

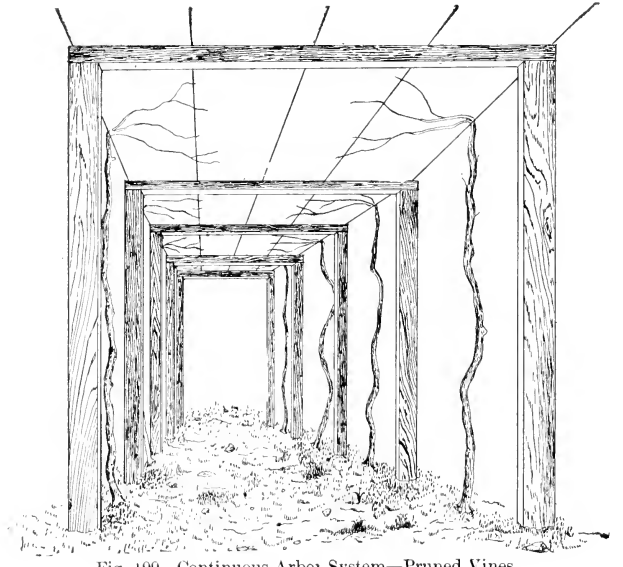


Fig. 199—Continuous Arbor System—Pruned Vines.

vines are trained to posts. The horizontal-arm spur, or Fuller system, is another illustration of the upright method. The method of training by arbor is the horizontal system, and it has its advantages as well as disadvantages. The scuppernong is generally cultivated in this way. The overhead Kniffin is a representation of the drooping system, and this system is very popular through many sections of the South.

Where grapes are cultivated on a small scale it pays the cultivator to bag the fruit, the recompense coming in the shape of superior fruit, and protection against the attacks of insects and disease.

VARIETIES OF GRAPES.

(*Vitis Aestivalis, Bourquiniana, Labrusca, Rotundifolia, Vinifera, Vulpina.*)

NAMES OF VARIETIES.	DESCRIPTION.				DISTRICTS AND ADAPTABILITY.						
	Size of Fruit.	Color of Fruit.	Quality of Fruit. Scale 1 to 10.	Season when Ripens.	Virginia	North Carolina South Carolina Georgia.	Alabama. Mississippi. S. Arkansas. N. W. Louisiana.	South and West Texas.	Florida. S. Louisiana.
Agawam	Medium	Red.	8	Medium	○	○	○	○	...
Berckmans.	Medium	Red.	10	Medium	...	○	...	...	...
Bertrand.	Large.	Blue	10	Medium	...	...	○○	...	...
Bland	Large.	Red.	8 to 9	Medium	○○	○○	○○	○○	...
Brilliant	Medium	Red.	8	Early	...	...	○○	○	...
Catawba	Large.	Red.	8	Late	...	○	○	○	...
Champion	Medium	Blue	2	Early	○○	○	○	○	...
Clinton	Medium	Blue	5	Late	○	○	○	...	...
Concord.	Large.	Blue	7 to 8	Medium	○○	○○	○○	○○	...
Cynthiana	Small.	Blue	9	Early	...	○○	○○	○	...
Delaware	Medium	Red	10	Medium	○○	○○	○○	○	...
Diamond (Moore's).	Large.	Gr. White.	8	Medium	○	○	○	...	...
Diana	Medium	Red.	7	Medium	○	○○	○	...	○
Elvira	Medium	Gr. White.	8 to 9	Medium	○	○	○	...	○
Flowers	Large.	Blue	4 to 5	Late	.....	○○	○○	...	○○
Goethe	Large.	Red	9 to 10	Late	○	○	○	...	...
Green Mountain	Medium	Gr. White.	3	Medium	...	...	○	...	...
Hartford	Large.	Blue	8	Early	...	○	○	○	...
Herbemont	Medium	Red.	9 to 10	Late	○○	○○	○○	○○	○
Ives	Large.	Blue	5 to 6	Early	...	○	○	○	...
Lenoir.	Medium	Black.	9	Late	.....	○	○	○	...
Lindley	Large.	Red.	9	...	○	○	○	○	...
Missouri Riesling	Medium	Gr. White	9	Medium	○	○○	○	○	...
Moore's Early	Large.	Blue	7	Early.	○	○	○	○	...

Moore's Diamond	Large	Gr. White	8	Medium		oo	o	o
Niagara	Large	Gr. Yellow	8	Medium	oo	oo	oo	oo
Norton Virginia	Small	Blue	9	Early	oo	oo	oo	o
Perkins	Large	Red	4	Very Early		o	o	o
Peter Wylie	Medium	Dull White	9	Very Early		o	o	o
Salem	Large	Red	9	Medium	o	o	o	o
Scuppernong	Large	Yellow	6	Medium		oo	oo	oo
Triumph	Large	White	10	Very Late		o	o	
Tenderpulp	Large	Black	5	Medium		o	o	oo
Thomas	Medium	Black	6	Medium		oo	oo	oo
Wilder	Large	Black	8	Medium	oo	o	o	o
Worden	Large	Black	8	Medium	o	o	o	

o Valuable. oo Very valuable.

Leading Market Varieties of Grapes.

Bertrand,	Diamond (Moore's),
Concord,	Herbemont,
Brighton,	Ives,
Delaware,	Niagara,
Diana,	Perkins.

Leading Wine Grapes.

RED.

Bertrand,	Herbemont,
Clinton,	Ives,
Concord,	Lenoir,
Cynthiana,	Norton's Virginia,
Thomas.	

WHITE.

Catawba,	Missouri Riesling,
Delaware,	Niagara,
Elvira,*	Noah,
Scuppernong.	

WINE.—There is no more art or mystery in making wine than in making cider. The grapes are crushed between wooden rollers, which run sufficiently near each other to crush the grapes, but not the seeds.

To make red wine, the crushed grapes should stand about twenty-four hours before pressing, so as to extract a portion of the coloring matter from the skins, when they may be pressed by means of an ordinary screw press. To each gallon of juice one and a half pounds of good clarified sugar must be added. If made from the pure juice of the grape, the wine will be thin, weak, poor, acid, and astringent stuff, not better than hard cider. All the best

* This grape makes the famous San Louis Sauternes Florida wine.

foreign wines have a large portion of brandy added; such as the Madeira and Sherry have near twenty per cent. In February or March following the wine should be racked off into clean casks, if intended for still wine, or bottled, if for foaming wine. At the time of bottling a table-

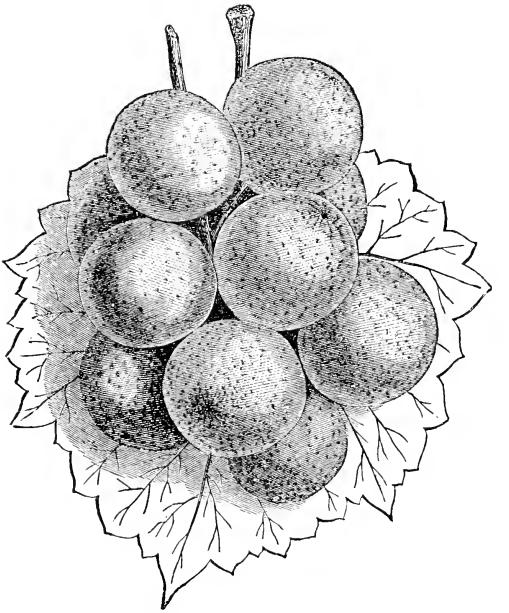


Fig. 200—The Scuppernong.

spoonful of No. 1 clarified sugar must be put into each bottle, which should be well corked. Some recommend rock candy to be added. We have found nothing better than good clarified sugar.

THE SCUPPERNONG.—We consider this very peculiar grape one of the greatest boons to the South. It has

very little resemblance to any of the grapes of the other sorts. It is a rampant grower, and requires little, if any, care or culture; grows well in any soil south of the Potomac river; has none of the shaggy bark peculiar to other vines, and bears only from the old, and not from the current shoots, as do other grapes. The leaves are cordate, or heart-shaped, coarsely serrate, smooth on both upper and under surfaces. It blooms from the 15th to the last of June, and ripens its fruit the last of September and beginning of October. It has no diseases, in wood, leaf, or fruit, and rarely, if ever, fails to produce a heavy crop. We have never known it to fail.

To this type of grape also belong the following mentioned in the table on a preceding page: Flowers, Tenderpulp and Thomas, which belong with the Scuppernong to *Vitis rotundifolia*. The first three produce black, and the last a yellow-white fruit. These grapes are peculiarly southern in origin and adaptability.

BRILLIANT (*Labr.-Hybr.*).—Originated by T. V. Munson, Denison, Texas. The result of a cross between Lindley and Delaware effected in 1883. Vines hardy and vigorous; bunches above medium, shouldered, compact; berries large, fully the size of Concord, resembling Delaware in color; skin thin, but quite firm; flesh tender and very juicy; flavor rich, sprightly, equal to Delaware. This is thought by many to be the best of the grapes originated by Professor Munson. The large berries, with their superior quality renders it one of the best grapes for table use, and the Brilliant should be included in every amateur collection. It will probably prove valuable as a market variety.

NIAGARA (*Labr. N*).—Originated by Hoag & Clark, Lockport, New York, in 1872; a cross of Concord and Cassady; vines very vigorous and very productive; bunches large, compact, sometimes shouldered; berry large, round-

ish; pale green in color, changing to pale yellow when fully ripe; skin thin, tough; flesh tender, juicy, sweet;

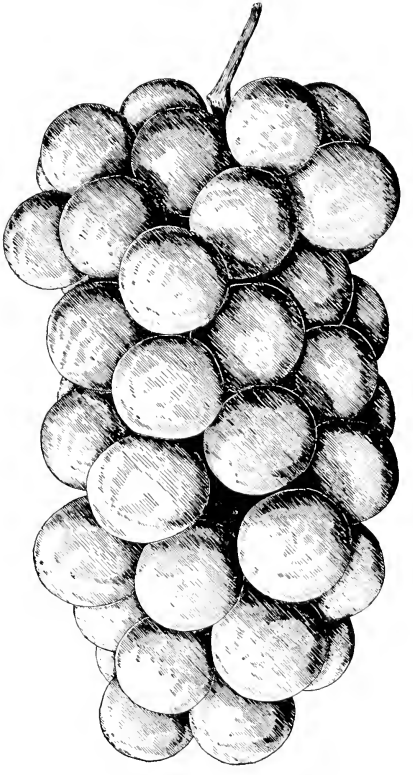


Fig. 201—Brilliant (after R. L. Watts).

similar to Concord in quality, ripening about with Concord. The Niagara is largely cultivated in Tennessee. It

is far from first class in quality, but the beauty of both bunches and berries, vigor and great productiveness of

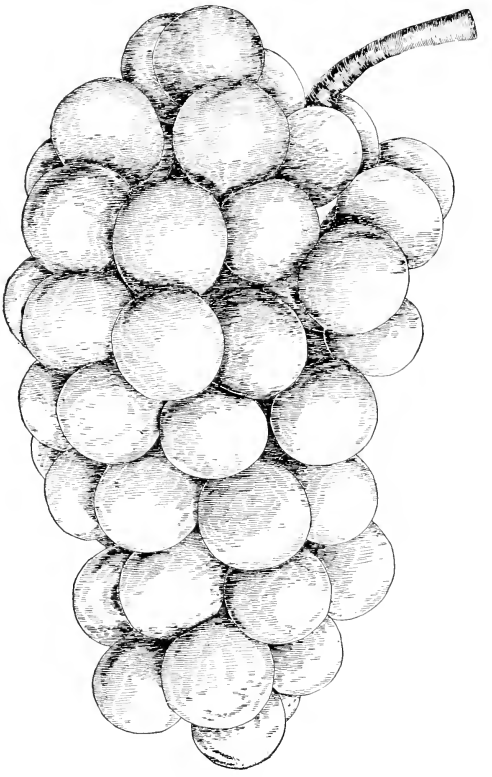


Fig. 202—Niagara (after R. L. Watts).

vines, render it a special favorite, and it leads all other white grapes in quantity grown for market.

DIAMOND (*Labr.* V.).—Originated by **Jacob Moore,**

Attica, New York, from seedling of Concord fertilized by Iona; vine vigorous and productive; bunch large, com-

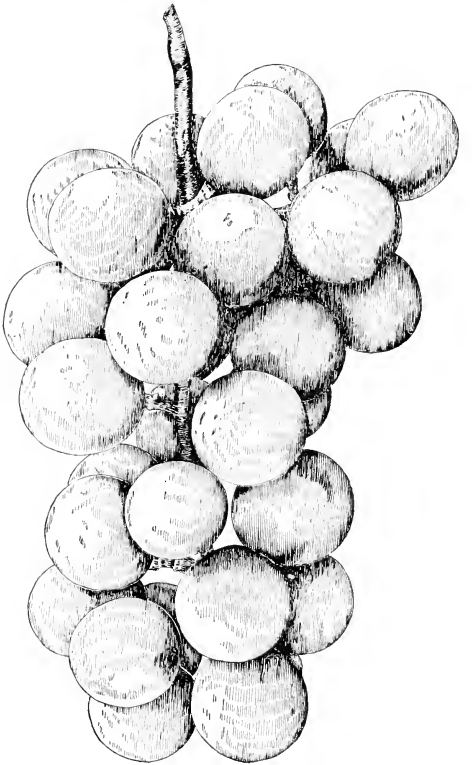


Fig. 203—Diamond (after R. L. Watts).

pact, shouldered; often double shouldered; berries above medium size, round, greenish-white; skin thin, rather tough; flesh tender, juicy, of high quality. We consider

this one of the best white grapes. It is well adapted both for market purposes and home culture. Ripe August 5th.

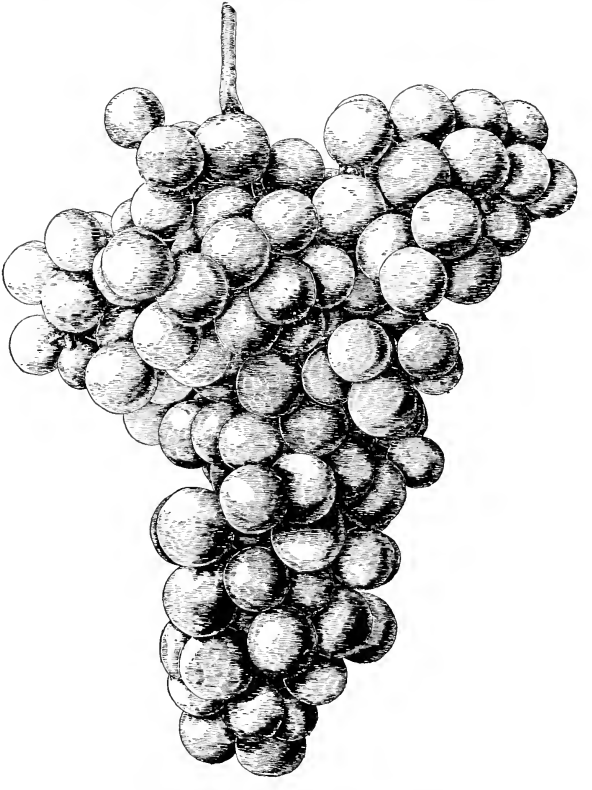


Fig. 204—Herbemont (after R. L. Watts).

Diamond is recommended by leading grape-growers of this country.

HERBEMONT (Aest.) Synonym, Warren; Herbemonte's

Maderia, Warrenton, Neil.—Origin unknown; a most vigorous grower and exceedingly productive; bunches

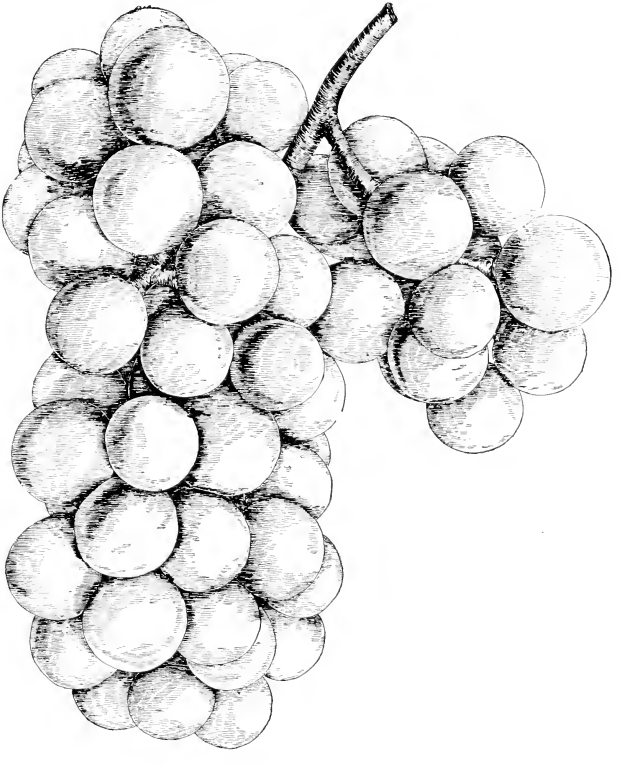


Fig. 205—Brighton (after R. L. Watts).

very large, long, shouldered and usually compact; berries small, black, with a blue bloom; skin thin; flesh tender, very juicy, rich, sprightly; quality very good. Ripe the

latter part of September; a very valuable late grape for home use.

BRIGHTON (*Labr. X Vin.*).—Originated by Jacob Moore,

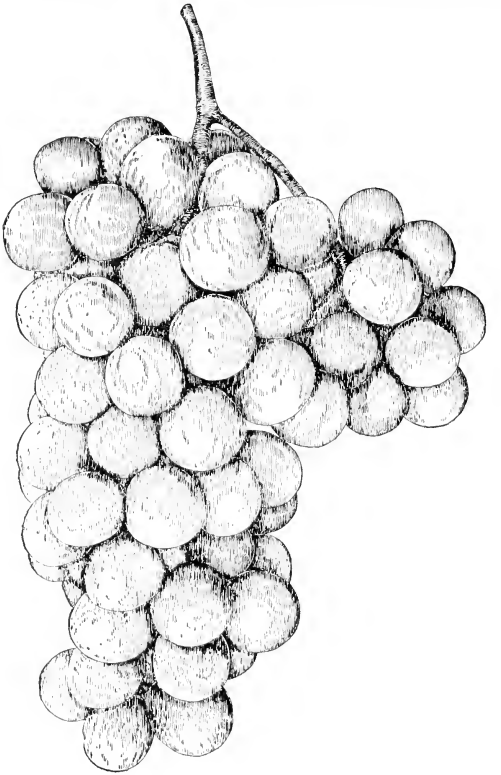


Fig. 206—Winchell (after R. L. Watts).

Brighton, New York; a cross between Concord and Diana-Hamburg; vine hardy, vigorous; canes medium to long-

jointed; foliage abundant; leaves large; bunch medium to large; moderately compact, shouldered; "berries medium to large, round, light red at first, changing to a dark crimson or maroon when fully matured, sometimes almost black, and covered with an abundant lilac bloom. The berries adhere well to the peduncle; skin thin but tough; flesh tender, slight pulp, sweet, juicy, slightly aromatic; very slightly vinous, and of very good quality for an early grape. It has its best flavor when it first ripens, but becomes pasty and looses its sprightly flavor when full ripe."—A. J. Downing. Ripe August 4th; vines very productive. It yields the largest crops when planted with other varieties to assist in fertilization. This variety is largely grown in the Eastern States, where it is the leading table grape.

WINCHELL (*Labr.*), OR GREEN MOUNTAIN.—A chance seedling found on the slopes of the Green Mountains of Vermont; bunches above medium, compact, well shouldered; berries medium, round, greenish-white; skin thin, quite tender; flesh tender, very sweet, rich, pleasant; quality very good. Ripe July 30th. Eminent grape-growers throughout the country have made many complimentary remarks concerning the Winchell, or Green Mountain grape. We consider it probably the best white grape in our vineyard for the home collection, and see no reason why it should not be highly profitable for market purposes.

DELAWARE.—This is one of the best grapes cultivated in the South. The fruit is rather small, round, of a red color and delightful flavor. It is one of the standard grapes, and is popular wherever grow

MARKETING.—The packing must be made so firm that there will be no shifting of the fruit in the basket. All defective and green or overripe grapes must be cut from the

bunches by scissors, and the bunches must be carefully assorted. The 5 and 10-pound baskets are used usually

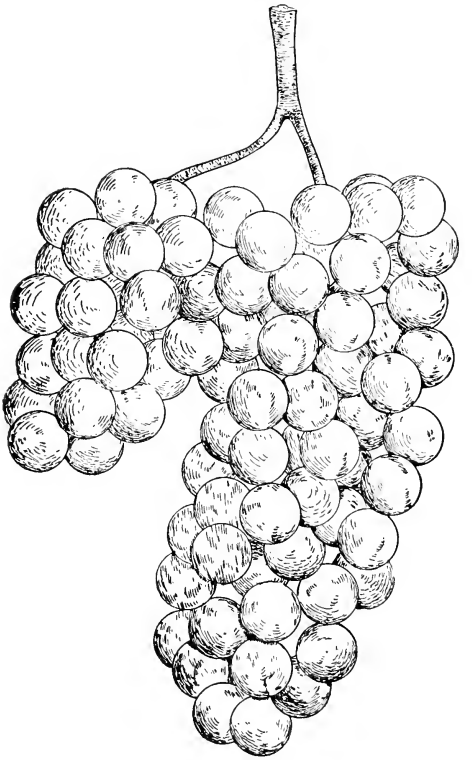


Fig. 207—Delaware.

for shipping grapes to markets. Handle the fruit as little as possible, so as to avoid injuring the "bloom," which makes the grape look so attractive and fresh when ex-

posed for sale. Turn the stems down as the bunches are placed in the basket and fill slightly above the top, so that when the cover is placed on the fruit will be firmly pressed into a secure position. This method of packing will insure a stemless surface when opened, and fruit will be better preserved in transportation.

GUAVAS.—(*Psidium.*)

There are several species and a number of varieties of this delicious fruit. The most important and those commanding popular favor in Southern Florida, where the plant attains its best growth, are Apple (*P. guajava*), Common Guava (*P. guajava*), Chinese or Mexican (*P. lucidum*), Cattley or Strawberry (*P. cattleianum*), White Winter (*P. guajava*).

The flowers are white, fragrant, and are in great numbers on the plant; the fruit is round, varying in size from one to three or four inches in diameter; the color of the fruit is either red, yellow or green; the flesh is crimson or yellow, and the flavor subacid, with a pleasant taste. The great objection to the fruit is the large number of seeds it contains, in some instances as many as four hundred.

The guava makes an excellent evaporated fruit, and, if the number of seeds can be reduced by selection and cultivation, it will become an important addition to the list of commercial fruits. It is highly esteemed for desserts, cooking and preserving and making into jellies. It is propagated by seeds, cuttings and layers. The young plant begins bearing when three years old, and sometimes earlier. It attains the size of a tree only in Southern Florida, while farther north it is more like a shrub.

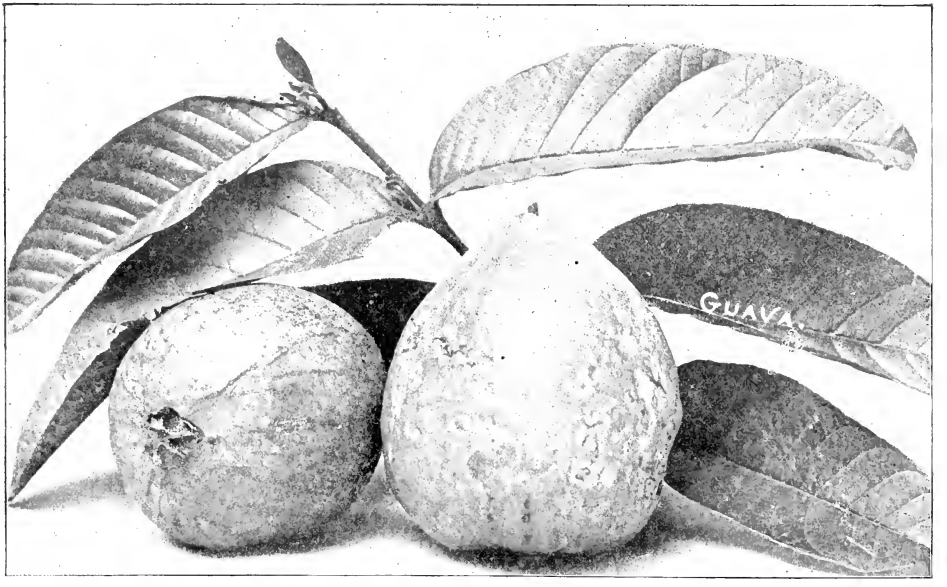


Plate 8—Guava (Photo by O. P. Haven.)

LOQUAT OR JAPANESE MEDLAR.

(Eriobotrya or Photinia Japonica.)

This plant belongs to the Rosaceae family, and was introduced into this country a few years ago from China or Japan. Its popularity is steadily increasing in the orange regions of Florida and Louisiana, where it is cultivated successfully. The fruit forms in clusters from white flowers of remarkable fragrance; it is small, one to one and a half inch in diameter, of a creamy yellow color, and in shape resembling a plum. The quality is subacid, juicy and refreshing. Ripens from February to May.

Cultivation.—It prefers a well-drained, sandy loam soil with a clay subsoil. Plant at distances adopted in the cultivation of the peach. The propagation is generally by seeds, and but little effort has been put forth to improve the Loquat by selection, although it seems to be susceptible to decided change when judiciously treated. The stocks used for its propagation should be some plant belonging to the Rosaceae family.

MANGOES.—*(Mangifera Indica.)*

This is a tropical fruit and will not thrive above the latitude where thin ice forms. It is grown in Southern Florida for home use, since the delicate nature of the fruit will not permit of shipping to any great distance. The tree is large and spreading with lanceolate leaves fully seven inches long. The flowers are white and grow in clusters at the ends of the branches. The fruit is shaped something like a cucumber, varying in color from green to orange. The plant grows rapidly, and, under proper treatment, will fruit when four years old. It can be propagated by budding, grafting or from the seeds. The following other varieties are grown in Florida:

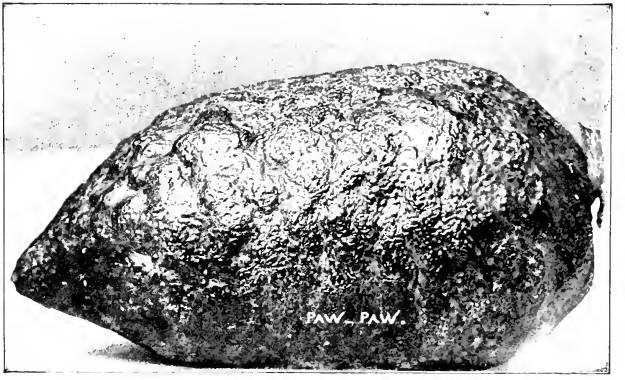


Plate 9—Pawpaw. (Photo. by O. P. Haven.)

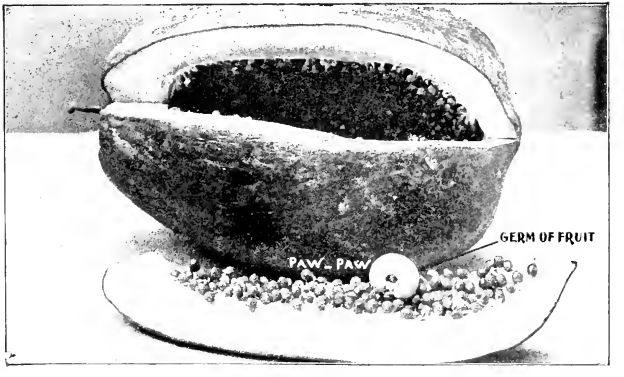


Plate 10—Pawpaw Section. (Photo. by O. P. Haven.)

COMMON MANGOES.—Originated in the East Indies; fruit large, reniform, yellow and red in color; quality good and ripens in summer. The tree is vigorous and prolific.

APRICOT.—Originated in East Indies; fruit medium size, kidney-shaped, red and yellow in colors; very good flavor.

APPLE, OR NO. 11.—Originated in West Indies; fruit large, round, yellow; very good flavor. A vigorous grower.

MINOR TROPICAL FRUITS.

Avocado Pear (*Persea gratissima*).
Cherimoya (*Anona cherimolia*).
Custard Apple (*Anonarecticulata*).
Granadilla (*Passiflora edulis*).
Hog Plum (*Spondias lutea*).
Jamaica Sorrel (*Hibiscus sabdariffa*).
Mammee Apple (*Lucuma mammosa*).
Otaheite Gooseberry (*Phyllanthus distichus*).
Pawpaw (*Carica papaya*).
Rose Apple (*Eugenia jambos*).
Sapodilla (*Achras sapota*).
Sour Sop (*Anona muricata*).
Spanish Lime (*Melicocca bijuga*).
Star Apple (*Chrysophyllum Cainito*).
Sugar Apple (*Anona squamosa*).
Tamarind (*Tamarindus Indica*).

In speaking of these minor fruits the Florida State Horticultural Society, in its catalogue published in 1897, says: "None of these are raised for market on a large scale, but all are desirable, and are extensively grown over a more or less extended area in the more tropical regions of the State, a number being produced in considerable quantities for local market or consumption. A few, like the Mammee Apple, Sapodilla and Avocada

Pear, ship well and find ready sale; the Avocada Pear, has brought good prices in the New York market. Some, like the foregoing, the Star Apple and the Hog Plum, are agreeable to most palates upon first acquaintance; others, like the Sugar Apple, Cherimoya and Soursop, which are much esteemed by those accustomed to the fruit, require an acquired taste to be appreciated. A number are grown for home use, almost or quite exclusively, either because too tender to transport, like the Sugar Apple and Pawpaw, or for their value for culinary purposes; of the latter, the Otaheite Gooseberry is a valuable acid fruit for cooking and preserving. The Jamaica Sorrel is not a fruit in the proper sense of the term, but produces a pulpy calyx, which makes an excellent substitute for cranberries. The acid Soursop is used for flavoring, preparing drinks, etc., and is much esteemed in sickness. The Tamarind bears a pod with a pleasant acid pulp which, preserved in sugar, finds ready sale in the general market."

MULBERRY.—*(Morus.)*

This genus includes two species worthy of cultivation, both hardy, deciduous trees, ripening their fruits in May with the later strawberries. The fruit is of very agreeable flavor, and of abundant subacid juice. An agreeable wine may be made of the juice. All the species of Mulberry are of the easiest culture, and are generally propagated by cuttings of the branches or roots. The former should be shoots of the last season, having one joint of old wood; they may be three feet long, and buried half their length in the soil. The tree requires little or no pruning.

The soil should be a rich, deep, sandy loam. The fruit falls when ripe; hence, when the tree commences bearing, the surface below should be kept in short turf, that the fruit may be picked from the clean grass.

Professor L. H. Bailey, of Cornell University, makes the following classification of the mulberry:

1. The White Mulberry group (*Morus alba*).
   (*a*) Russian Mulberry (*var. Tartarica*).
   (*b*) Nervosa Mulberry (*var. Venosa*).
2. The Multicaulis group (*Morus latifolia*).
3. The Japanese group (*Morus Japonica*).
4. The Black Mulberry group (*Morus nigra*).
5. The Red or Native Mulberry group (*Morus rubra*).
   (*a*) Lampasas Mulberry (*var. tomentosa*).

BLACK MULBERRY (*Morus nigra*) is a native of Persia, and is a slow-growing, low-branched tree, with large, tough leaves, often five-lobed, producing large and delicious fruit, frequently an inch and a half long, and an inch across; black, and fine flavored. Tree a very poor grower.

RED MULBERRY (*Morus rubra*) is a native of our woods; leaves large, rough, and generally heart-shaped; fruit an inch long, sweet and pleasant, but inferior to the black. The vigorous growth and fine spreading head of this variety make it worthy of culture as an ornamental tree. It is the most tenacious of life of any tree we have ever seen. Twenty-seven years since we dug one up in our garden, and annually up to the present time shoots put up from fragments left in the ground, and thus far we have been unable to exterminate it. If the cherry is planted near the house, and the Mulberry a little more distant, the latter will often attract the birds from the former.

The varieties recommended for the South are:

DOWNING'S EVERBEARING.—Originated by Charles Downing, of Newburgh, New York, from the seed of *Morus multicaulis*. Tree very vigorous and productive; an estimable variety, and surpassed by none except the black English, and possessing the same rich, subacid flavor. It

continues in bearing a long time. Fruit one and a quarter inch long and nearly a half-inch in diameter. Color, maroon, or intense blue-black at full maturity; flesh juicy, rich, and sugary, with a sprightly vinous flavor.

HICKS' EVERBEARING.—This mulberry originated in Georgia, and is very productive. It fruits from three to

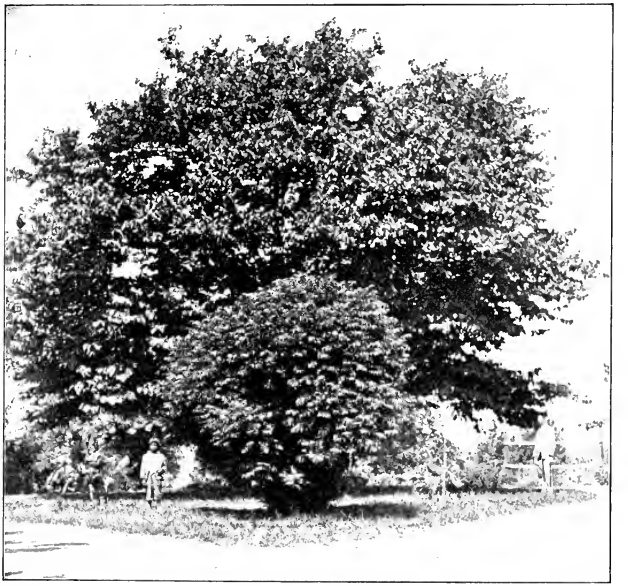


Fig. 208—Black Mulberry Tree.

four months. It has an insipid, sweet taste, but is an excellent food for hogs and chickens. This tree should be grown by every one who raises poultry on an extensive scale.

STUBBS' MULBERRY.—Originated in Laurens county, Georgia, more than twenty years ago. It is a very vigor-

ous grower, with broad foliage. The fruit is large, black and of excellent quality. The tree remains in fruit about two months.

NECTARINE.—*(Persica vulgaris, var. lævis.)*

The Nectarine is merely a peach with a smooth skin. It is impossible to distinguish the tree from the peach by its leaf and flowers.

Nectarines usually produce nectarines from the seed; but the Boston Nectarine originated from a peach-stone.

The tree is cultivated and pruned like the peach, and is propagated by grafting or budding on peach stocks. The great difficulty in raising Nectarines (and the same is true of the apricot and plum), is the curculio. The smooth skin of these fruits offers an inviting place for this insect to deposit its eggs. The injured fruit may be known by being marked with a small, semi-circular scar, as if cut by a baby's nail.

It is useless to plant either the Nectarine, Apricot, or Plum, especially in sandy soils, unless the trees are daily jarred, and the insects collected on sheets as they fall, and immediately destroyed. A limb may be sawed off a tree, and the stump hit a few smart blows with a mallet; if gently shaken, the insect will not let go its hold. Or another plan is to plant the trees by themselves, and admit poultry and hogs to eat the fallen fruit, which will, if other fruit gardens are not near, protect the crop. Spraying the tree as soon as the blossoms fall will be more effective; but not certain. For formula see chapter devoted to spraying. In using the spraying material great care must be exercised so that the leaves and tender twigs will not be injured with too strong arsenical compounds. The borer infests the Nectarine as well as the Peach. Aside from the curculio, the nectarine is as hardy and easily raised as the peach, though scarcely equal to the

best peaches in flavor. It requires the same soil and treatment as the peach. The best varieties are:

EARLY VIOLET.—Glands reniform; flowers small, fruit large, roundish, pale yellowish-green, with a purplish-red cheek, mottled with brown; flesh whitish-red at the stone, melting, juicy, and delicious. Ripens July 20th.

ELRUGE.—Glands reniform; flowers small; fruit medium; roundish oval; suture slight; skin pale green, with deep violet or blood-red cheek, and minute brown specks; flesh pale green, pale red at the stone; melting, juicy, and rich; stone oval, rough, and pale colored. Ripens July 25th.

DOWNTON.—Glands reniform; fruit large, roundish oval; skin pale green; flesh red at the stone, melting and delicious. Ripens July 25th.

BOSTON.—Glands globose; flowers small; fruit large, roundish oval; skin bright yellow, with a deep red cheek; flesh yellow, not rich, but sweet and pleasant. Ripens last of July. (*Cling.*)

NEW WHITE.—Glands reniform; flowers large; fruit large, nearly round; skin white, with slight tinge of red in the sun; flesh white, tender, juicy, vinous, and rich; stone small. Ripens August 1st.

STANWICK.—A European variety; skin pale greenish-white, shaded into deep violet in the sun; flesh white, tender, juicy, and rich; sweet, and without the slightest prussic acid flavor. Ripens August 1st. (*Free.*)

NUTS.

There are several kinds of nuts worthy of cultivation by every planter, many of which are ornamental shade trees, besides being valuable for the fruit they yield. For convenience, we class them under one head.

CHESTNUT (*Castanea*).—The Chestnut is a very large forest tree, and common to both continents. The Spanish Chestnut or Marron, produces a very large, sweet nut, and is propagated by grafting on our common chestnut. There are several varieties of this, of which "Marron de

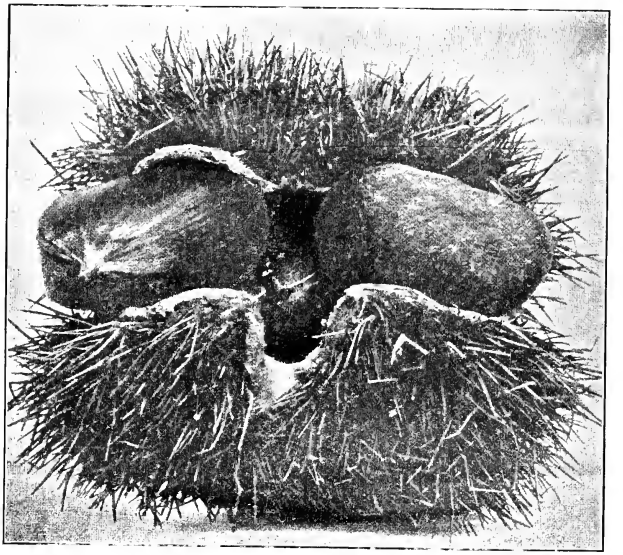


Fig 209—The Burbank "Early" Chestnut. From Nature. (Amer. Gardening)

Lyon" is the best. It will bear the second year from the graft. Chestnuts are difficult to transplant when taken from the woods. The improved varieties are much superior to the wild sorts. The chestnut as a shade tree is very effective in landscape gardening. It is stated in a circular issued by the Division of Pomology, United States Department of Agriculture, that "the European

Plate 11—A Chestnut Grove in North Carolina Mountains.

sweet chestnut (*castanea sativa*) has been grafted for many years in France and England upon the European black oak (*quercus robur*), using young seedlings raised by planting acorns where the trees are to remain permanently." A few experiments have been made recently in the United States with a degree of success, using the chestnut oak (*quercus primus*) as a stock.

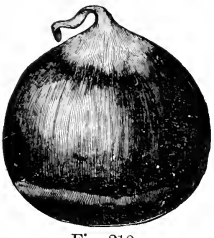


Fig. 210.
American Chestnut.

THE COMMON WILD AMERICAN CHESTNUT (*castanea dentata*) grows in the mountains and the hilly regions of the South, and bears its fruit in great abundance. The nuts, however, are not as large as those produced on the imported varieties; but they are sweeter. The native chestnuts have been greatly improved by transplanting and grafting, and by careful cultivation. The demand for the nuts is steadily increasing.

LARGE SPANISH OR MARRON DE LYON (*castanea sativa*). The nuts are very large, but not as sweet as the American. The large size command attention, and there is a better market for them because of that fact.

Fig. 211—Spanish Chestnut.

JAPAN GIANT OR MAMMOTH (*castanea Japonica*).—The growth from the seeds is uncertain as to results, and the seeds are often unreliable. Grafting is the only sure method to reproduce this plant in perfection. The burr generally contains as many as five large nuts. The trees do not grow tall, but are dwarf in habit.

CHINQUAPIN (*castanea pumila*).—This is a shrub generally, but it sometimes grows to the size of a tree. It is

hardy in most of the hilly regions of the Atlantic States from Virginia to Alabama. The nuts are small, solitary in the burr, of a beautiful mahogany color, and of a sweet flavor. The chinquapin grows wild, and but little effort has been exerted to improve it by cultivation. The nuts find their way into the local markets along with the wild chestnuts.

SHELL-BARK HICKORY (*Hicoria orata*).—This tree is found in fertile soils all over the United States, producing the common thin-shelled, white hickory nut. The tree is very regular and beautiful for ornamental purposes. There is considerable difference in the size and flavor of the nuts of different varieties. It is generally cultivated by planting the nuts in the fall; these should be slightly covered with leaf mould.

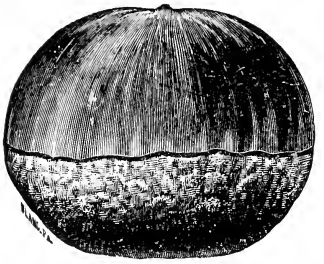


Fig. 212—Japanese Chestnut (*Castanea Japonica*).

FILBERTS (*Corylus Avellana*) are generally raised from layers. They should not be allowed to sucker; but trained to form low heads near the ground, which should be kept tolerably open by thinning out the small spray, and shortening back the young shoots every spring. Of the varieties,

COSFORD is a large, oblong nut, with a thin shell, and of fine flavor. Prolific.

WHITE FILBERT.—Like the last, but with a light yellow or white skin; husk long and tubular; nuts ovate.

LAMBERT.—Nut compressed, large and oblong; the kernel has a rich flavor. Prolific.

PURPLE FILBERT.—The leaves and fruit have a purple color. A good variety.

PECANS.—*(Hicoria pecan.)*

This tree has been considerably cultivated by orchardists within the past few years, and in many sections of the

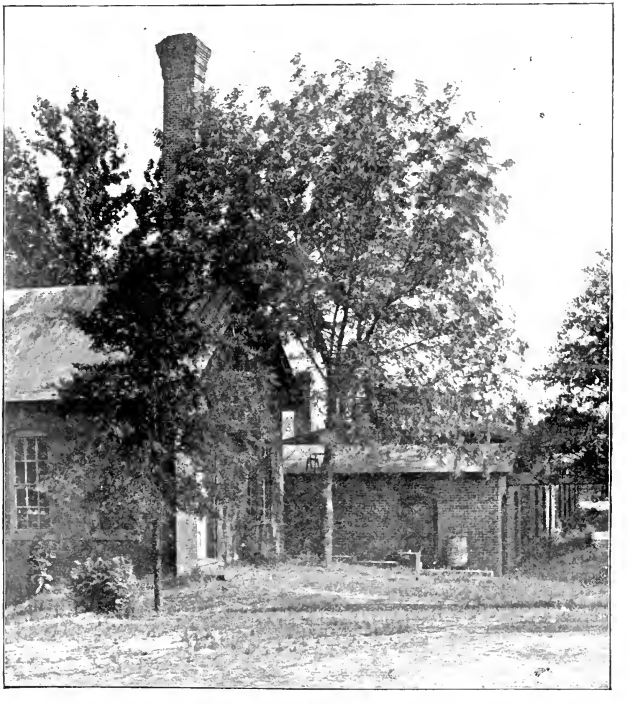


Fig. 213—Paper Shell Pecan Tree (Large tree in centre of picture.)

South extensive orchards are now in existence, and are yielding fine revenues to the owners. The tree reaches its bearing period in eight to ten years after planting. The character of soil suitable for the hickory will serve

admirably for growing the pecan. In Florida the question of growing this tree has long since been satisfactorily answered. It has been found well adapted to the soil and climate of that State. It has also been successfully grown for many years in Louisiana and Texas. From these States, probably, the largest quantity reaches market. In the making of an orchard it is best to plant one to two-year-old trees, since this age is more certain to grow than when older plants are taken. Pecans may be propagated from the seed, but this method is rather uncertain, and it is best to graft or bud. If raised from seeds proceed as follows: Prepare the land thoroughly by deep plowing; run off drills three to four feet apart, and place the nuts about fifteen inches apart in the drills. After one year old take up the plants carefully, preserving as many fibrous roots as possible; cut off one-half of the tap root and reset at once in the place where the orchard will be permanently situated. The best variety of the pecan is the

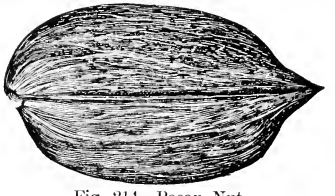


Fig. 214—Pecan Nut.

LOUISIANA AND TEXAS PAPER SHELL.—The shell, as the name indicates, is very thin and the nut is large. It commands a high price, because of the size of the nut, the thinness of the shell and the fine flavor of the kernel. There are several forms of this variety sold by nurserymen, known by such local names as Biloxi, Centennial, Colorado, Mexican, Pride of the Coast, Stuart, Van Deman, etc.

WALNUTS.

MADEIRA NUT, OR ENGLISH WALNUT (*Juglans Regia*) is a fine, lofty tree, with a handsome, open head, producing the well-known nuts of the shops. It is produced from

the seed, or by grafting. Likes a rich, moist soil. *Juglans praeparturiens* is similar to the above, but bears fruit when three years old, and is valuable on this account for the garden.

BLACK WALNUT (*Juglans nigra*) should have a place in

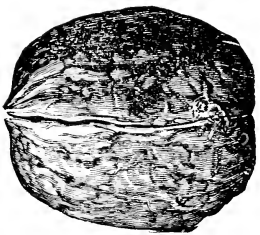


Fig. 215—English Walnut (*Juglans regia*).

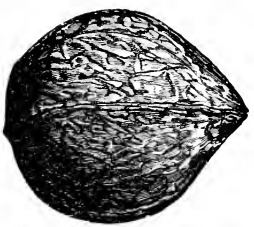


Fig. 216—Japan Walnut.

the grounds of the amateur, as it is not only a fine shade tree, but is valuable for its fruit and timber.

JAPAN WALNUT (*Juglans Sieboldiana*).—Shells of the nuts are thick, and the kernel is sweet. The nuts form in clusters. The tree produces a pleasing appearance, with

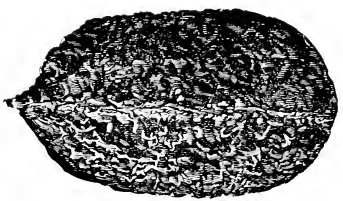


Fig. 217—Butternut (*Juglans cineria*).

its large leaves, and makes an attractive addition to ornamental grounds, parks, etc.

BUTTERNUT, OR WHITE WALNUT (*Juglans cineria*), is a native American nut, greatly prized by many. The shell is thick and rough, and the kernel is rich in flavor. It

can be propagated by seeds, but the sure way to secure the type is to bud or graft.

OLIVE.—*(Olea Europea.)*

The Olive is a low-branching, evergreen tree, rising to the height of twenty or thirty feet, with stiff, narrow, bluish-green leaves. The fruit is a drupe, of oblong, spheroidal form; hard, thick flesh of a yellowish-green color, turning black when ripe. The tree is a native of Greece and the seacoast ridges of Asia and Africa; it has been cultivated from time immemorial for the oil expressed from its ripe fruit. Where cultivated it answers all the purposes of cream and butter, and enters into every kind of cooking. Unripe olives are much used as pickles, which, though distasteful at first to most persons, become by custom exceedingly grateful, promoting digestion, and increasing appetite. The ripe Olive is crushed to a paste, when the oil is expressed through coarse hempen bags into hot water, from which the pure oil is skimmed off. If the stone is crushed the oil is inferior. Lime and potash should be applied as fertilizers, should the soil be deficient in these substances.

Propagation and Culture.—Olive plantations are generally formed from the suckers which grow abundantly from the roots of old trees.

It grows readily from cuttings and seeds. With the aid of a sharp knife secure the cuttings from strong, healthy young shoots, and remove all leaves except two or three at the top. Plant in boxes of moist sand, which are placed in warm, shady localities. After rooting the young plants are potted and given more sunshine for several months, when they are transplanted in the orchard.

The cultivated Olive may perhaps also be grafted on our *Olea Americana, or Devil Wood*, which abounds on our seacoast. The best trees are from seeds which commence

bearing in five or six years, but are not remunerative until ten or twelve years old. The trees produce fifteen to twenty pounds of oil per year, and their longevity is greater than that of any other fruit tree. The dry limestone soils of Florida would probably become exceedingly valuable if planted with the Olive.

It should be tried wherever the Orange will survive the winter. In planting, the trees are set from thirty to forty feet apart. The European varieties are many, but we enumerate only a few.

In 1801 General Nathaniel Greene, of Revolutionary fame, planted four hundred olive trees at Dungeness, on Cumberland Island, Georgia, and in 1895 they were forty feet high and two and one-half feet in diameter. It is said that one thousand barrels of olives were gathered from these trees in one season. Unfortunately, the unusually cold weather of 1895 that damaged so seriously the orange trees of Florida, also killed these olive trees at Dungeness, so that they were cut down. Strong shoots are now putting forth from the stumps, and the proprietor is trying to start the trees in the direction of another magnificent growth.

Mr. P. J. Berckmans, in speaking of the olive, makes the following comments: "Olives have been cultivated on the coast of Georgia and South Carolina for many years, and an excellent quality of oil has been produced. A peculiarity of the olive is that it flourishes and bears abundant crops on rocky and barren soils, where no other fruit trees are successful. Olive trees begin to bear fruit at from eight to ten years of age, but should not be planted farther north than this section (Augusta, Ga.), where they are sometimes injured by excessive cold."

The following varieties are recommended:

Nevadillo Blanco.—This is of Spanish origin, and is the variety from which most of the oil shipped from

Spain is extracted. The tree is a rapid grower, and the branches are pendant.

PICHOLINE (*oblonga*).—This variety is an early fruiter, and the tree grows very rapidly. It is not so liable to insect attacks as is the case with some of the other varieties. In Florida and South Georgia this variety is very popular.

THE ORANGE, LEMON, ETC.

THE ORANGE (*Citrus*) is a native of Asia. The rich golden fruit displayed among its dark, glossy, evergreen

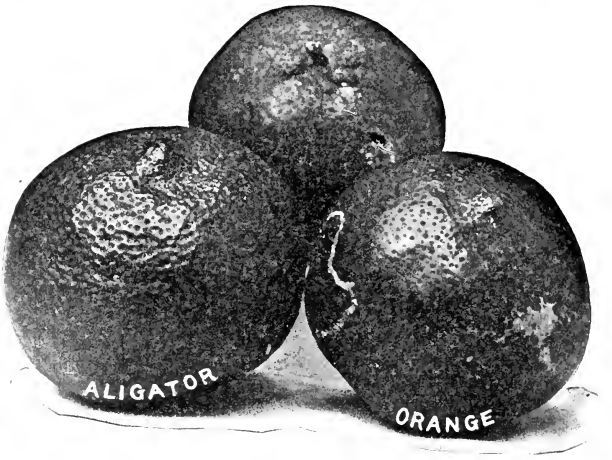


Fig. 218—Alligator Orange. (Photo. by O. P. Havens.)

foliage renders it the most beautiful of fruit trees. The tree grows to the height of twenty to thirty feet, with a round, symmetrical head; the bark of the trunk is of an ashy-gray, while that of the twigs is green. The leaves are of a fine, healthy, shining green; its blossoms are delicately fragrant, and as the tree is in all stages of bear-

(547) Plate 12—Sour Wild Orange. (Photo. by O. P. Havens.)

ing at the same time, in flower and ripe golden fruit, nothing can surpass an orange grove in attractiveness. The wild, bitter-sweet orange is found in various parts of Florida as far north as 29°; its occurrence is said to be indicative of a good soil. It may have originated from the Seville orange introduced by the Spaniards. The orange is extensively cultivated in Florida, and somewhat on the coast of Georgia and Carolina.

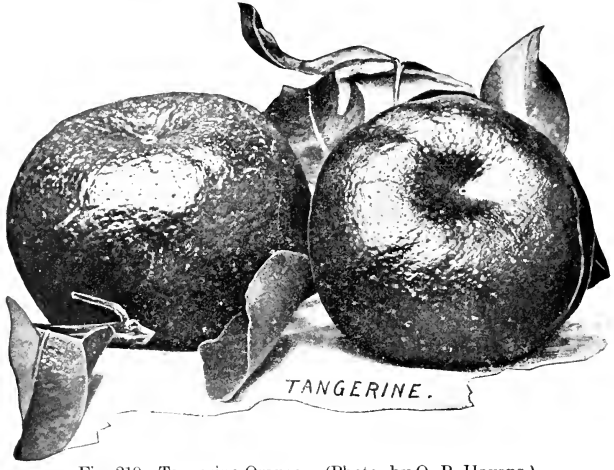


Fig. 219—Tangerine Orange. (Photo. by O. P Havens.)

Lime is essential to the healthy growth of the tree; the best soil is a deep fertile loam on the banks of rivers.

The wild orange taken from the woods is generally used as a stock to graft the most desirable varieties upon.

There are about seventy-five varieties of oranges cultivated, of two principal classes, viz.: The Sweet or China Orange, and the *Bitter Seville* or *Wild Orange*. The latter class is much the more hardy, but of no value as a dessert fruit. They are used in cooking, preserving, wine-making,

and for flavoring. Of the sweet oranges, the Maltese has a thick and spongy rind, red and delicious pulp, but sometimes with a trace of bitterness. The glands which secrete the oil are prominent.

There are three species of oranges cultivated, viz.:

Citrus bigaradia, or Bitter Oranges.
Citrus nobilis, or Mandarins.
Citrus aurantium, or Sweet Oranges.

Fig. 220—Satsuma Orange. (Photo. by O. P. Havens.)

The Horticultural Society of Florida, in the proceedings of the tenth annual meeting for 1897, gives the following account and recommendations concerning these species and their varieties. Of the six varieties of bitter oranges mentioned in their catalogue the BITTER SWEET and PHILLIPS' BITTER SWEET are recommended as constituting varieties of the "highest excellence in all the desired characteristics of season, quality, distinction, pro-

ductiveness, etc." The varieties of Mandarines recommended are Satsuma and Tangerine.

The Satsuma is a seedless variety of the Mandarin or "kid-glove" class, and it will stand a considerable reduction of temperature, even to 25°, when other kinds of oranges will be destroyed. The color is a deep orange, and the flavor is juicy and rich. It matures fruit from

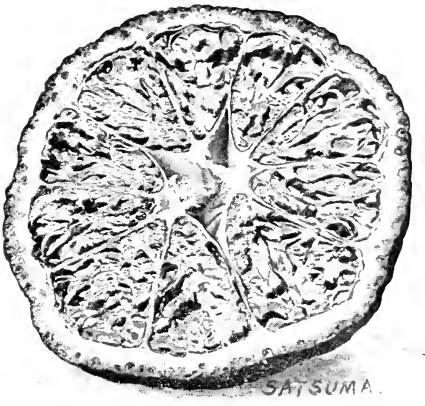


Fig. 221—Section of Satsuma Orange. (Photo. by O. P. Havens.)

September to November, and is hardy as far north as Southern Georgia. It is well adapted for portions of the country in Northern Florida, Southern Georgia, and along the Gulf coast. The plant is prolific, and it begins bearing fruit when quite young.

The varieties of sweet oranges recommended by the Florida Horticultural Society are:

Bessie,	Du Roi,
Boone,	Early Oblong,
Centennial,	Enterprise Seedless,
Double Imperial Navel,	Foster,

Hart's Late,
Higley's Late,
Homosassa,
Imperial Blood,
Jaffa,
Jaffa Blood,
King,
May's Best,
Nonpareil,
Old Vini,
Paper Rind,
Parson Brown,
Pineapple,
Sanguinea,

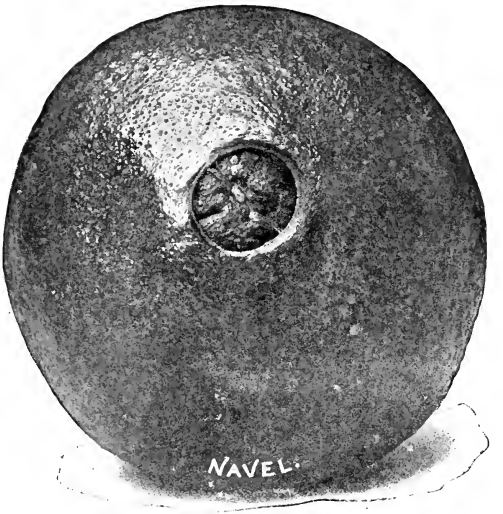


Fig. 222—Washington Navel Orange. (Photo. by O. P. Havens.)

Majorca,
Maltese Blood,
Maltese Egg,
Maltese Oval,
St. Michael Blood,
Sweet Seville,
Valencia Late,
Vinous,
Washington Navel (Bahia).

The navel varieties are much esteemed on account of the delicate texture and superior quality of the fruit. They are generally shy bearers, although experience indi-

cates that they are much more prolific upon rough lemon and Trifoliate stocks than as generally grown on orange stocks. The Blood varieties are sweet, and therefore marketable early in season. At this time their distinctive character is not apparent, and they have little advantage in market over other early sorts. As the season advances their ruby tints develop until quite apparent on

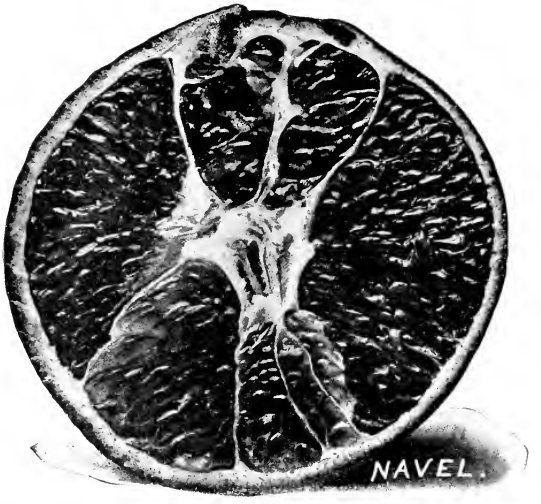


Fig. 223—Section of Washington Navel Orange. (Photo. by O. P. Havens.)

the exterior, and their quality continues to improve; at full ripeness they are equalled by few and surpassed by none. In locations sufficiently exempt from frost to permit their being held on the trees until they reach perfection, they bring high prices, and are exceptionally profitable. The Satsuma is valued on account of its hardiness, which is increased by being grafted on the hardy Trifoliate stock. As it is marketable before cold weather (it

ripens very early) many trees are planted in sections north of the usual range of oranges.

Excluding the Navels, Bloods and Satsumas, noted above, and without disparagement to other sorts of equal merit, the following are suggested as a desirable list for general planting, arranged in order of succession:

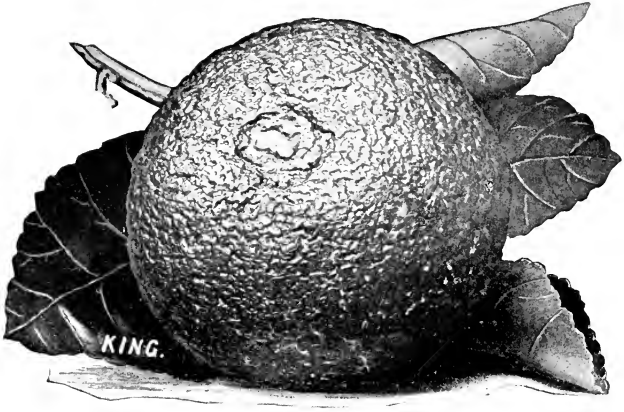
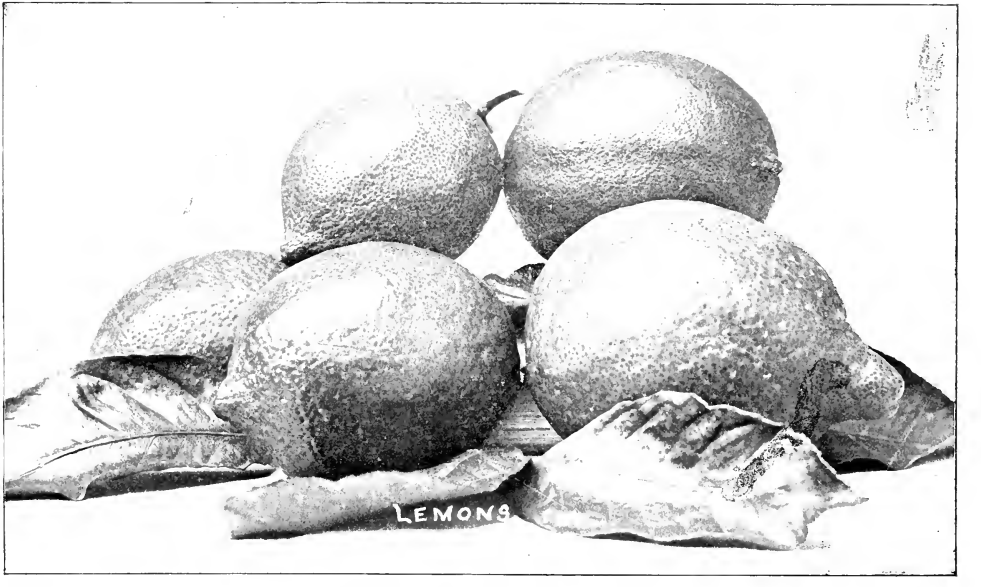


Fig. 224—King Orange. (Photo. by O. P. Havens.)

Very Early.—Boone, Sweet Seville.
Early.—Enterprise, Seedless, Parson Brown.
Early Medium.—Nonpareil, Centennial.
Medium.—Pineapple, Jaffa, Homosassa.
Late Medium.—Majorca, Du Roi.
Late.—Bessie, King, Maltese Oval.
Very Late.—Hart's Late.

THE LEMON (*Citrus Limonum*) is cultivated like the orange, but has longer, lighter-colored leaves, with naked petioles or footstalks; flowers tinged with red externally; fruit oblong, with a swollen point; pale yellow color, with an acid pulp. Used mostly for flavoring, and lemonade



(554) Plate 12—Lemon. (Photo. by O. P. Havens.)

and other cooling drinks. The trees are usually very productive. The following varieties are recommended and highly esteemed by the fruit-growers in Florida: Belair, Eureka, Genoa, Imperial, Sicily, Villa-Franca.

THE LIME (*Citrus acida*) has smaller flowers than the lemon, which are white; fruit small, round, and pale yellow color, with a slight protuberance at the end; very acid. Used for the same purposes as the lemon. The green fruit makes a delicious preserve. The varieties are: Mexican, Persian, Rangpur and Tahiti. The two last are excellent in quality.

CITRON (*Citrus Medica*).—Has large, oblong, wingless leaves; flowers tinged with red or purple; the fruit is very large and lemon shaped, with warts and furrows. Rind thick and fragrant, pulp subacid. Used for preserves. The varieties are: Lemon, Lymon and Orahne. The last is generally considered to be the best in quality.

SHADDOCK AND GRAPE FRUIT (*Citrus Decumana*) have leaves winged like the orange; flowers white; fruit globular, and very large, weighing often six to eight pounds; rind very thick; pulp dry, sweetish, or subacid. The desirable varieties are: Aurantium, Blood Shaddock, Forbidden Fruit (usually applied to entire list), Hart, Josselyn, Mammoth or Orange Shaddock, Pernambuco, Triumph, Walter.

KUMQUATS OR KIN KANS (*Citrus Japonica*).—This citrus fruit originated in Japan, and is more hardy than the orange. It is known in Japan by the name of *Kumquat* and in China by the name of *Kin Kan*. The plant is dwarfish in habit, but the shape is beautiful and attractive. The fruit occurs in clusters, and is much desired for preserving, pickling and making into jams. The plant is very ornamental, and makes a desirable addition to the list of shrubs for the lawn in that portion of the country where the orange tree is successfully grown. Because of

(556) Plate 14—Kumquats or Kin Kans. (Photo. by O. P. Havens.)

its small size the Kumquat is also well suited for room decoration, and it is made all the more attractive because of the bright yellow clusters of fruit which hang on the limbs in profusion all winter. The flowers are also abundant. There are two varieties, differing only in the size and shape of the fruit—the Marumi (round fruit) and Nagami (oblong fruit). The latter is the largest, and is the variety usually grown in Florida.

MARKETING.—Citrus fruits are packed in crates and barrels which are well ventilated. It is of the greatest importance that the fruits should be in prime condition before packing, because nothing so much detracts from the value of the package as to have unsound fruit mixed with the good. Great care should also be taken to select and grade the fruit and pack each size in separate crates, and, in the case of oranges, wrapping each one in tissue paper. Pack firmly and press in well, so that the packages will not show shrinkage when the crates reach their destination. Fruit sells well when the greatest care is taken in packing the same sizes and qualities together and avoiding all unsound and unsightly forms.

PEACH.—(*Persica vulgaris.*)

The Peach is a native of Persia, whence its cultivation has proceeded westward; but it has nowhere found a soil or climate more congenial to it than in these Southern States. Indeed, the peach is the favorite, and in many instances the only fruit tree cultivated by our planters. It requires a soil of but moderate fertility; its enemies and diseases are but few, and the return so speedy that there is no excuse for being without good peaches.

A somewhat serious difficulty in peach culture, which results from bad pruning, is the tendency to overbear and break down the limbs from the excess of the crop. More peach trees are destroyed or badly injured from

this cause than any other. Peach trees should always be pruned by cutting off the extremities of the branches, so as to leave about one-half of the last year's growth. The fruit is produced on these small branches, and by reducing the top in this manner, overbearing is prevented, the fruit is effectually thinned, and is larger, finer flavored, and nearly as much fruit can be taken from each tree without danger of breaking. The tree is also kept low and close, and more trees and larger crops can be grown to the acre.

This method of pruning is called *shortening in,* or heading in, and is expeditiously done with pruning shears. Old trees that have got out of shape can be pruned and brought into a symmetrical form by sawing off limbs of two or three years' growth at or near the forks; by this method old trees can be renewed in vigor as well as in form. Pruning can be performed at any time when the leaves are off. If it is wished to make young trees produce early, they may be shortened in the last of July, the year they are transplanted. Care should be taken that the branches do not divide into forks, as they are exceedingly apt to split when bearing a crop of fruit. The peach, like all other fruit trees, should branch low, say within two feet of the ground, and be kept in a pyramidal or round form, as nearly as can be done.

The loss of the fruit by decay as it approaches maturity is more annoying than anything else in peach culture.

If the season is warm and wet very few kinds ripen well if on moist or rich earth or soil. There is a very common opinion that peaches propagated from the stones of unripe fruit are more liable to rot than those from stones or pits of fully ripened fruit; some also think decay is caused by planting the trees too deep. It is, however, certain that some varieties are much more subject to decay than others placed in the same position.

The most suitable soils to ripen sound and high flavored fruit are dry, but moderately fertile; hills and hillsides generally are the best locations for the peach; thinning the fruit so that no two peaches touch each other is very necessary in order to prevent decay. The peach is mostly used in its fresh state for the dessert, and is generally considered the most delicious fruit of temperate climates. When allowed to ripen on the tree, it is the most wholesome of fruits, and as an article of food is considerably nutritious. Peaches are also used for pies, are preserved in brandy and sugar, and are excellent when dried for winter use. For culinary purposes the clings are most preferred. Peaches and cream form a delicious dessert dish.

For drying take those of the best quality, just as they are ripe enough to eat; halve them, remove the stones, and sprinkle over them a little nice sugar, and dry them in a brick oven, moderately warm. Thus prepared the aroma and flavor are preserved, and they are free from insects. If the peaches were fully ripe, no cooking will be required, but when used they are simply soaked in cold or warm water. Sufficient sugar, varying with the acidity of the fruit, is added before drying. The firm, yellow fleshed are the best for drying. Peaches thus prepared are only inferior to the fresh fruit, as they retain much of the flavor. Dried in the usual way from unripe fruit, exposed to the sun, much of the flavor is dissipated. Peaches are excellent preserved in self-sealing cans, which now can be purchased at reasonable prices.

Lime, potash and the phosphates are the chief elements the peach requires in the soil. Bone-dust and wood ashes are valuable applications, much more suitable than common animal manures. They may be dressed with compost of woods' earth, or swamp muck, if the soil is very poor.

When the trees are planted the holes may be made large, and enriched with well-decayed manure, to give a good growth of wood. For this purpose guano is an excellent application; but it is fatal to the tree if it comes in contact with the roots. I have applied it with success to all kinds of fruit trees. After the holes are dug, a little guano is sprinkled in them; this is then covered with about two inches of good mould, on which the tree is planted. When the tree is planted, another sprinkling of guano may be added, and covered with a little more earth; two or three tablespoonfuls are sufficient for a tree, and but a small quantity is required for a large orchard. For this purpose, as well as for manuring most shrubs, rose bushes, etc., few applications are so cheap and satisfactory. After the tree begins to fruit, applications of lime, ashes, or leaf mould are much better than those which excite growth, as they do not impair the flavor of the fruit or induce decay.

The peach is best propagated by budding and grafting upon seedling peach stocks. There are, however, many varieties of the clings, particularly, that reproduce themselves from the seed, especially if the tree from which the stone is taken stands apart from other varieties. It is believed that the stone of a seedling is more apt to reproduce its kind than if taken from a budded tree. Seedlings often escape frosts that are fatal to the finer varieties, but the highest flavored varieties of seedlings are often quite as susceptible of injury as those budded or grafted; those varieties bearing large flowers are much less liable to be injured by frost than those having small ones.

Plum stocks are recommended by foreign writers; but they are of little use in this climate, for the graft soon outgrows the stock and breaks off. Peach stocks are raised by planting the stones two or three inches deep, in the autumn or winter. If the stones are cracked they are

more sure to grow. Abundance of stocks can often be procured by taking the volunteers that spring up under the trees in early spring, when about an inch high, and transplanting in rows three feet apart and one foot in the row. Plant them in good soil, where they will grow rapidly; if the season is good they will be of sufficient size to bud in August. When the inserted buds start in the following spring, the stocks may be cut down to within two inches of the bud; and then keep rubbing off the shoots or robbers for at least two months; otherwise the inserted buds will be overpowered by them, and die, or make but feeble growth.

The buds had best be inserted in the north side of the stock to screen them from the sun. Peach trees raised, or varieties originating, in the Northern States are not at all unfitted for our climate, yet there is some risk of importing trees from the North on account of diseases peculiar to that section from which Southern raised trees are exempt.

Some varieties of European fruits are found to succeed better here than where they originated, but as a general rule, all fruits succeed best in their native locality.

Peach trees in transplanting are set twenty feet apart each way, which gives one hundred and eight trees to the acre. If shortened in yearly, they may be set fifteen feet apart, which will give one hundred and ninety-three trees to an acre; in gardens fifteen feet is generally the best distance.

Peaches are so much alike in general character—the difference in outline, color, flavor, and texture being less than with other plants—that it is necessary in order to determine the name of a variety to resort to other methods of distinction.

The two most obvious distinctions or divisions are into freestones and clingstones; or, as we call them, soft and

plum peaches; the flesh of the former parting freely from the stone, and being of a melting consistency; and that of the latter named sorts adhering to the stone, and being of a firmer texture. The English give to these divisions the names of "melters" and "pavies."

Both these grand divisions are subdivided into classes according to the color of the flesh, viz.: Those with light colored and those with deep yellow flesh. These classes are again divided into three sections. At the base of the leaf of some varieties will be found small glands, which are either round and regular, or oblong and irregular, or kidney-shaped; while others have no glands, but are more deeply cut or serrated like the teeth of a saw.

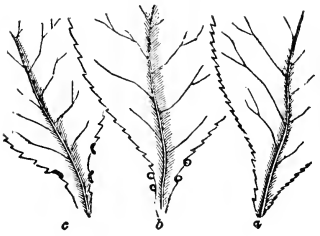


Fig. 225.

Hence the three sections, viz.: 1. Leaves serrated, without glands (*a*, Figure 158); 2. Leaves with small, round, or globose glands (*b*, Figure 158); 3. Leaves with large, irregular, reniform or kidney-shaped glands (*c*, Figure 158).

From the blossom another characteristic is derived, giving us two sub-sections—the first embracing large flowers, red in the center, and pale at the margin; the second, small flowers, tinged with dark red at the margin. Most native peaches in this vicinity have large flowers, but the great mass of the finer varieties have small flowers.

Varieties.—The following varieties have been tried and are found among the most desirable. They are classed pretty much in the order of ripening. All named are good bearers.

ALEXANDER.—A prolific peach of bright color; large

flowers; fruit medium size, red skin, white flesh and firm. Ripens May to June. Semi-cling.

ANGEL.—Originated in Florida and highly prized in that State. Fruit above average, round; whitish-red skin; greenish white flesh; best quality in flavor, and early. Freestone.

RIVERS.—Flowers from March 9th to 30th; flowers large; fruit above medium; skin white, tinged with red; flesh white. Fruit ripens from middle of June to the first of July. Freestone.

HALE.—Glands globose; fruit medium, nearly round; skin mottled red; cheek dark red; flesh white, melting, juicy, and high flavored; flowers large. Tree vigorous, healthy, and an abundant bearer, ripening ten days or two weeks before any other good variety. Free. (*Thomas.*)

TILLOTTSON.—Leaves deeply serrated, without glands; fruit medium, round; skin nearly covered with red ground; color pale yellowish-white, dotted with red, the cheek being quite dark; flesh white, red at the stone, to which it adheres slightly, although a freestone; melting, rich, and juicy, with a high flavor. Ripens from the 15th to the 20th of June. Free.

EARLY YORK.—Leaves serrated, glandless; flowers large; fruit medium, roundish oval; suture slight; skin thickly dotted with pale red on a greenish-white ground, dark red in the sun; flesh greenish-white, tender, melting full of rich, slightly acid juice. Ripens June 20th. Free.

GEORGE IV.—Glands globose; flowers small; fruit large, round, with broad suture; skin white, dotted with red, cheek rich dark red; flesh pale, melting, very juicy, with rich, luscious flavor; stone small. Ripens July 10th. Free.

GROSSE MIGNONNE.—Glands globose; flowers large; fruit large, roundish, apex depressed; suture distinct;

skin dull white, mottled with red, and with a purplish-red cheek; flesh red at the stone, melting, juicy, with a rich vinous flavor; stone small and very rough; perhaps the best freestone peach in cultivation. Ripens July 10th. Free.

CRAWFORD'S EARLY.—Glands globose; flowers small; fruit yellowish-white, with a fine red cheek; flesh yellow, melting, sweet and excellent. Ripens middle of July. Free.

COLUMBIA.—Originated in Georgia; flowers large; fruit large, round; skin rough; flesh yellow and excellent flavor. Ripens in July. Freestone.

ELBERTA.—This peach also originated in Georgia, and is a prolific bearer. The flowers are large; fruit round, compressed; skin yellowish-red; flesh yellow and of fine quality. Ripens from July 10th to August 6th. Freestone.

FOSTER.—An excellent peach for family use. Flowers small; fruit fine grained and juicy, with delightful flavor; skin yellowish-red; flesh yellow. Ripens in the latter part of July. Freestone.

STUMP.—Flowers small; fruit round oval; skin light red; flesh white, firm and juicy; of best quality. Ripens about the middle of July. Freestone.

TRIUMPH.—This peach ripens about the time that the Alexander comes to maturity, and it is a favorite among orchardists for a shipping variety. The flavor is slightly acid, juicy and pleasant; skin yellow with a crimson blush; flesh yellow; medium size. Freestone when fully ripe.

OLDMIXON CLING.—Glands globose; flowers small; fruit large, roundish oval; suture at the top; skin yellowish-white, dotted with red; cheek red; flesh light, melting, juicy and rich, with a high, luscious flavor. Ripens last of July and early in August.

LATE RARERIPE.—Glands globose; flowers small; fruit large, roundish oval; skin downy; color, grayish-white, marbled with red in the sun; flesh pale, juicy, melting, and of a rich, luscious flavor. Ripens last of July.

LATE ADMIRABLE.—Glands globose; flowers small; fruit large, roundish oval; suture distinct; apex swollen, acute; skin pale yellowish-green, with a pale red cheek, marbled with dark red; flesh pale, melting, and fine flavored. Ripens August 10th to 15th. Free. A superb peach.

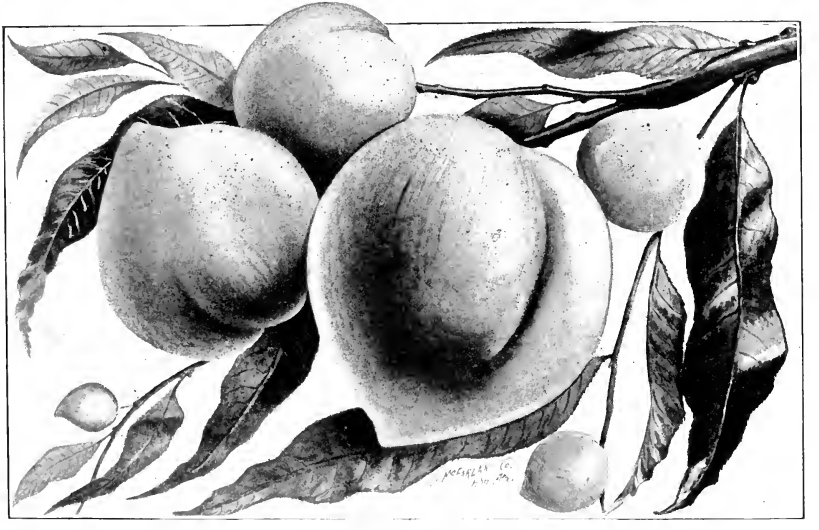
CRAWFORD'S LATE.—Glands globose; flowers small; very large, roundish; suture shallow, but distinct; skin yellow, with dark-red cheek; flesh deep yellow, red at the stone, juicy, and melting, with rich, vinous flavor. Ripens early in August. Free.

LEMON CLING.—Glands reniform; flowers small; leaves long; fruit large, oblong, narrowed at the top, with a swollen, projecting point; skin dark yellow, reddened in the sun; flesh fine yellow, red at the stone, flavor rich and vinous. Ripens August 10th.

PRESIDENT.—Glands globose; large, roundish oval; suture shallow; skin downy, pale yellowish-green, with a dull-red cheek; flesh pale, but deep red at the stone, very juicy, melting and high flavored; stone very rough. Ripens August 15th. Free.

TIPPECANOE.—Glands reniform; flowers small; fruit very large, nearly round, with a point; skin yellow, with a fine red cheek; flesh yellow, juicy, with a fine vinous flavor. Ripens August 20th. Cling.

CHINESE CLING.—Leaves large and very dark green; fruit very large, sometimes weighing one pound; color creamy yellow, with a pale red cheek in the sun; flesh pale yellow, coarse, but of good vinous flavor, juicy enough, but has a little too much prussic acid flavor. Tree a very vigorous grower; flowers large. Ripens August 10th.



(566) Plate 15—Everbearing Peach. About two-thirds natural size.

From a photograph taken from the original tree (after Berckmans).

EATON'S GOLDEN.—A premium peach from North Carolina; flowers large; fruit large, and resembles Crawford's Late in appearance; color bright yellow, marbled with bright red, dark on the sunny side. The best late cling we have yet seen. Ripens October 10th.

BALDWIN'S LATE.—Fruit large and round, with a swollen point; skin greenish-white, with a pale red cheek; flesh firm, juicy and melting, and good flavored. Ripe October 20th, and will keep for several weeks in the house. Free.

PEENTO.—Fruit medium size, flat; white skin and flesh; freestone; good quality. Ripens early. Tree vigorous grower and very prolific. This peach thrives well in Florida, and is popular, particularly in the central and southern portions of the State. It also does well in South Louisiana.

EVERBEARING PEACH.—"This is one of the most remarkable peaches, as it combines many desirable qualities which make it of great value for family use.

"1. Its long continued bearing period. The first ripening begins about July 1st, and successive crops are produced until the beginning of September. Fruit in all stages of development—ripe and half grown—may be seen upon the tree at the same time.

"2. As the tree blossoms during a long period, a complete failure of fruit has, therefore, never happened since the original tree first began to bear, eight years ago.

"3. The fruit is creamy white, mottled and striped with light purple and with pink veins; oblong in shape, and tapering to the apex; flesh white, with red veins near the skin; very juicy, vinous, and of excellent flavor; quality very good to best. Freestone of the Indian type.

"The first ripening averages three and a half inches long by three inches broad. The size of the second and following crops diminishes gradually, until that of the

last ripening is about two inches in diameter. A supply of fruit may, therefore, be secured from the same tree for nearly three months in succession.

"We do not recommend the Everbearing Peach for commercial orchards, but for family use, or small gardens, where there is room for only a few trees, its value is unquestionable. We offer it with confidence, as we have known the original tree for the past three years, and

Fig. 226—Bidwell Early Peach. (Div. Pomology, U. S. Dept. Agri.)

gathered the fruit in its various stages of development." (*Berckmans.*)

The following additional varieties are popular in some sections of the South:

Amelia,	General Lee,
Bidwell Late,	Mountain Rose,
Bidwell Early,	Onderdonk,
Beer's Smock,	Sneed,
Kerr (Jessie),	St. John,

Waldo.

Peaches suitable for Middle Virginia, West North Carolina, North South Carolina, North Georgia, Northeast Alabama, and Middle Tennessee:

Alexander,	Late Admirable,
Beer's Smock,	Late Crawford,
Early Crawford,	Late Rareripe,
Elberta,	Mountain Rose,
Foster,	Oldmixon Cling,
George IV.,	Rivers,
Grosse Mignonne,	Sneed,
Hale,	Stump,

St. John.

Peaches suitable for Eastern Virginia, Eastern North Carolina, the southern half of South Carolina, the southern half of Georgia, all of Alabama except the northeastern portions, Mississippi, Southeast Arkansas, North Louisiana, and Eastern Texas:

Alexander,	Kerr (Jessie),
Amelia,	Late Crawford,
Chinese Cling,	General Lee,
Columbia,	Lemon Cling,
Early Crawford,	Mountain Rose,
Early York,	Oldmixon Cling,
Elberta,	Sneed,
Everbearing,	St. John (Yellow),
Hale,	Tillottson.

Peaches suitable for Southern Louisiana and Florida:

Angel,	Early Cream,
Bidwell Early,	Ferdinand,
Bidwell Late,	Florida Crawford,
Cabler Indian,	General Lee,
Countess,	Gibbons,
Dorothy N.,	Honey,

Imperial,	Sneed,
Jewel,	Suber,
Maggie,	Taber,
Onderdonk,	Thurber,
Pallas,	Victoria,
Peento,	Waldo.

MARKETING.—Early peaches are shipped in baskets packed in crates. When the fruit becomes more plentiful, however, well ventilated barrels may be used. Equal care must be exercised in assorting this fruit and packing separately the same sizes and grades as is cautioned in shipping oranges. Too great emphasis cannot be placed on this important point. Take care in handling the peach, so as not to injure the "bloom" on the fruit.

PEAR.—(*Pyrus communis.*)

The Pear is often found growing wild in hedges in various parts of Europe, China and Western Asia. It is a thorny tree, with upright branches, tending to the pyramidal form. The wild fruit is exceedingly harsh and astringent; but no fruit whatever is more delicious, sugary, and melting than its best improved varieties. The pear was early brought into cultivation; there were thirty-two varieties in Pliny's time, yet they were "but a heavy fruit, unless boiled or baked," and it was not before the seventeenth century that it became really worthy of culture for the dessert. Indeed, the majority of the best varieties have originated within the last century. The pear, under favorable circumstances, is a long-lived tree. The Endicott pear tree, still living in Danvers, Massachusetts, was planted by Governor Endicott in 1628, or eight years after the landing of the Pilgrims.

M. Bosc mentions trees in Europe which are known to be four hundred years old. Even in this State trees that were in full bearing forty years ago are still healthy, vigorous, and productive. It will endure in suitable soils

greater extremes of heat than the apple, succeeding well in latitudes too warm for the latter fruit to flourish. It is better adapted to southern climates than the apple, while in cold climates it succeeds as well.

The pear is the most delicious of fruits for the dessert; and, in this latitude, by choosing proper varieties, we are able to have them ten or eleven months of the year. The finer kinds often sell in the cities for one or two dollars per dozen. It is excellent for baking, preserves and marmalade. It may be dried like the apple and peach, and, with or without sugar, will keep for years. Perry is made from the juice, as cider from the apple. The wood is fine-grained and compact, and, dyed black, is used in place of ebony.

Dessert pears should have a sugary, aromatic juice, and a soft, melting, subliquid texture. Some few of a crisp, firm, or breaking consistency are very good. Pears for stewing or baking should be large, firm-fleshed, and moderately juicy. The harsh, austere kinds are thought best for perry.

Gathering and Preserving the Fruit.—Most varieties of the pear are much better if picked from the tree before fully ripe, and ripened in the house. Indeed, some few kinds, like the Heathcote, Bartlett and Van Assche, will ripen well if gathered at any time after they are half grown. When a few begin to turn yellow and ripen on the tree, then gather the whole crop.

Many of the most delicious varieties, if allowed to ripen on the tree, become dry, insipid, and only second or third rate. They will also ripen more gradually, last longer, and be less liable to loss or injury, if ripened in the house. It is said, however, a few varieties do best to ripen on the tree. When gathered, some few kinds ripen more perfectly by exposing them to the light and air. Most of them do best, however, in kegs or small boxes, or

on the shelves of a cool, dark fruit-room, each one separately enveloped in paper or loose cotton. This is not necessary with the summer varieties. Pears, like apples, must be gathered by hand, with the same precaution to prevent bruises, or they will soon decay. Winter pears should hang as long as may be upon the tree. A week or two before their proper time to ripen, bring them from the fruit-room into a warm apartment; this will much improve their flavor.

Propagation and Culture.—Pears are propagated by budding or grafting on seedling pear stocks or on certain varieties of the quince. Pear suckers should never be employed for this purpose, for they seldom have good roots, and the trees are short-lived; a great deal of prejudice exists against pear culture from this cause. Seedlings raised from the thrifty-growing kinds that are found about the country are much more healthy than those raised from the improved varieties.

Sow the seed thickly in autumn, in drills eighteen inches apart, or, better still, mix the seed with sifted sand in a box, and place it out doors during winter, and sow in the spring, when they begin to sprout, in good, rich earth; the latter mode saves the seed from being destroyed by ground mice.

Ashes are an excellent application to the seed-bed; the soil should be moist, as much of the value of the stocks depends on vigorous and continued growth the first season. Take up the stocks in November or December, shorten the tap-root, and reset them in rows four feet apart, putting those together which are of about the same size. The best of them, if in a good, rich soil, will be fit to bud during the next summer, and nearly all the balance can be whip-grafted the ensuing spring.

Many kinds of pears grow well on the quince, and come some years earlier into bearing. We have found the com-

mon quince to be equally as good as the Angers, when worked side by side with them. The fruit produced from trees worked on the quince is usually larger and better flavored than on the pear, and the trees can be set much nearer together. They come into bearing in two or three years, but are not as long-lived as when worked on the pear stock. In planting the trees on pear stocks they should be set twenty feet apart; but as these will be several years before they come into bearing, the spaces should be filled up with dwarf trees, growing on the quince stock, so as to have them, when planted, ten feet apart. Thus a plantation of sixteen trees, set in a square, on the pear stock, would require thirty-three on the quince to fill the intervals—making a square of seven trees on a side. This will prevent the attacks of the quince borer, and add to the longevity of the tree.

The soil must be kept clean and well tilled; but it should not be deeply spaded within two feet of the trunks of the trees. No fruit tree will be healthy or bear well if the ground is deeply spaded near its stem. The pear likes a deep, strong loam, similar to that required by the apple. Iron is beneficial; hence the pear succeeds well in our red clay loam, if deeply dug and sufficiently manured. For pears on the quince stock, the soil should be deep and cool. From the analysis of the wood and bark of the pear tree, it is apparent that wood ashes and superphosphate of lime cannot but be very beneficial to the growth and fruitfulness of the pear.

In pruning the pear, the object is to make it throw out branches within a foot of the ground, and to encourage its growth in its natural pyramidal shape.

Not much pruning is required the first year; but any shoot that, by overgrowth, threatens to destroy the beauty of the tree should be pinched in at once. When the tree is transplanted, if it has been out of the ground

for any length of time it must be severely shortened in. If the tree has good roots, the top will soon be renewed. Severe pruning at this time is the only way to make the tree branch out near the ground, so as to shade the trunk and give a fine pyramidal shape. To secure this, plant maiden trees, or those one year old from the bud. When they have grown one year, cut back the branches in the winter; pinch in any shoots, during the summer, that would mar the symmetry of the tree, or remove them entirely, if superfluous.

Head back the leader each year, to strengthen the side branches. The leader must be shortened more or less, according to its vigor. A little practice will enable any one of ordinary judgment to form his trees in the desired shape. Do not let the branches remain so close together that, when they come to bear, they will cause the fruit and foliage in the interior to suffer from want of air; keep the lower shoots the longest by pinching those above, when disposed to overgrow them. This makes a beautiful tree, ornamental even for a flower garden.

A greater number of varieties of the pear are in cultivation than of any other fruit. Of those that have fruited here, the following are the most desirable. The varieties do not always observe with us the order as laid down in the books.

MADELINE.—Fruit medium, obovate, tapering to the stem, which is long and slender, set on the side of a small swelling; skin smooth, yellowish-green; calyx small, in a shallow basin; flesh white, melting, juicy, sweet, and perfumed. Ripe from the 1st to the 15th of June.

DOYENNE D'ETE, OR SUMMER DOYENNE.—Fruit small, roundish, slightly turbinate; skin smooth, light yellow, shaded with bright red, sprinkled with small gray or russet dots; stalk rather short, thick, fleshy where in-

serted in the fruit, in a very slight depression; calyx small, partly closed in a shallow, slightly corrugated basin; flesh white, melting, juicy, and sweet. The best very early pear; ripens with, and superior to, the Madeleine; in Georgia early in June, in New York last of July. Tree vigorous; an early and profuse bearer; leaves long, oval, pointed, and dark green; seeds dark.

Bosc.—Fruit large, pyriform, somewhat uneven, tapering gradually to the stalk; skin smooth, dark yellow,

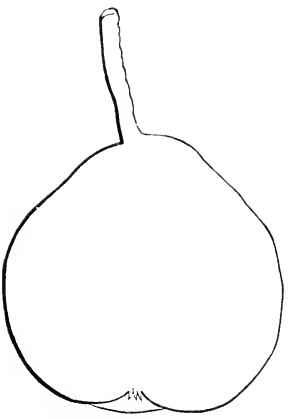


Fig. 227—Doyenne d'Ete.

nearly covered with rich cinnamon russet; stalk varies sometimes, being large and fleshy, as in the figure, or long, rather slender, and curved; flesh white, melting, buttery, abounding in rich, sugary, and delicious juice, slightly perfumed. Ripens—Georgia, in September and into October; New York, October and November. Tree healthy and productive.

Louise (Bonne de Jersey).—Fruit large, oblong, pyriform; skin smooth, glossy, pale green in the shade, brown-

ish-red in the sun, sprinkled thickly with minute dots; stalk about an inch long, obliquely inserted without depression or with a fleshy base; calyx small, open, with

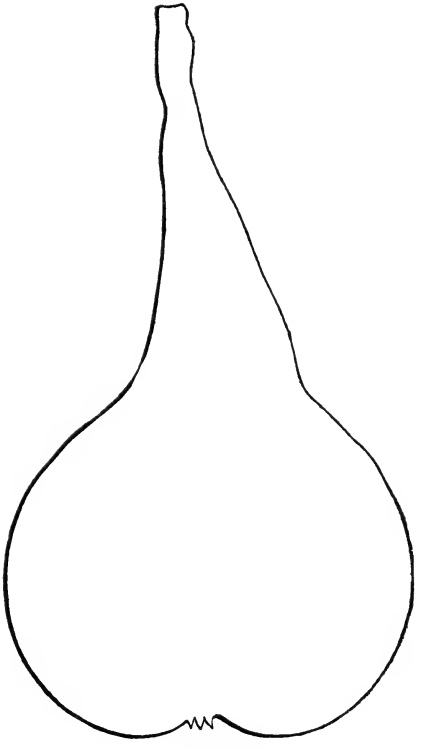


Fig. 228—Bosc.

rather long segments, in a shallow, uneven basin; flesh greenish-white, very juicy and melting, and excellent. Ripens—Georgia, August 10th, and through the month;

New York, September and October. The tree is an upright, vigorous grower, forming a fine pyramid. The fruit is much better on the quince than on the pear.

BLOODGOOD.—Fruit medium, turbinate (at the South

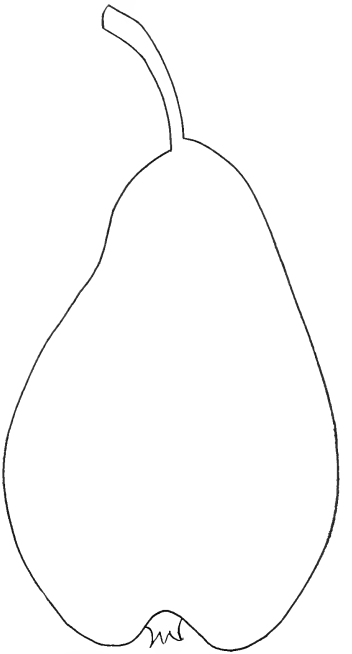


Fig. 229—Louise (Bonne de Jersey).

often oblate), generally thickening abruptly to the stalk; skin yellow, considerably russeted in dots and net-work patches; calyx large, open, in a slight depression; stalk obliquely inserted, about an inch long, dark brown, fleshy at its base; flesh yellowish-white, buttery, with a rich

musky aroma, melting and sweet; core small. Georgia, last of June; New York, last of July. Generally larger than in the figure.

MANNING'S ELIZABETH.—Growth of tree moderate; shoots reddish, dotted with brown; fruit rather small, regular oblate inclining to obovate, or Doyenne-shaped; skin smooth, bright yellow, dotted with russet, with a

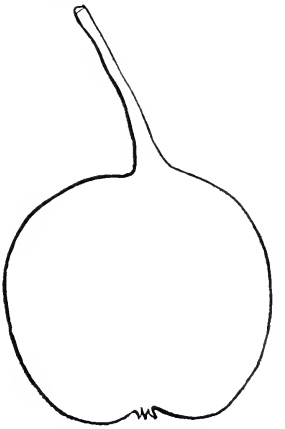


Fig. 230—Bloodgood.

bright red cheek; stalk scarcely an inch long, often a little fleshy at its base, inserted in a shallow, regular cavity; calyx open, in a broad, shallow basin; flesh white, juicy, melting, with a sprightly saccharine flavor. Ripens—Georgia, July 10th; New York, middle and last of August. The best pear of its season; productive.

BARTLETT.—Fruit large, irregular, knobby, obtuse-pyriform, often much more oblong than in the figure; skin very thin, smooth, clear light yellow, with a slight blush in the sun, sprinkled with minute russet dots and with

faint russet markings towards the stem; stalk about an inch long, stout, in a shallow cavity; calyx small, partly open, in a very shallow, slightly plaited basin; flesh white,

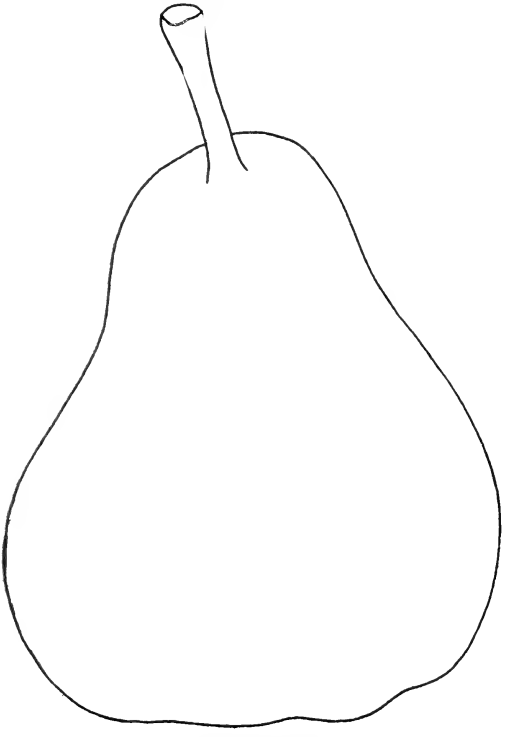


Fig. 231—Bartlett.

exceedingly fine-grained, melting; full of agreeable, vinous juice. Ripens—Georgia, through August; New York, September. Specimens that fall before they are fully grown, ripen nicely in the house. Sometimes too

acid, but one of the most desirable sorts. Origin—England, 1770. Tree quite fruitful, and bears young.

BRANDYWINE.—Fruit above medium, varying from oblate-depressed-pyriform to elongated pyriform; skin yellowish-green, dotted and sprinkled with russet, with a bright red cheek; stalk fleshy where it joins the fruit;

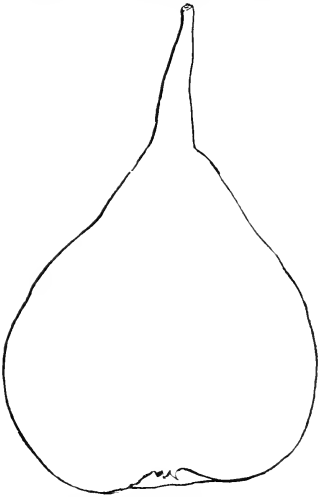


Fig. 232—Brandywine.

calyx open; basin shallow; flesh white, juicy, melting, sugary, and somewhat aromatic. Georgia, ripe the middle of July; New York, the last of August. Growth vigorous and upright; leaves small, deep glossy green; productive.

WHITE DOYENNE.—The White Doyenne, or Virgalieu, is one of the most esteemed pears. Fruit medium to large size, generally larger than the figure, varying from obovate-pyriform to oblate; skin clear pale yellow, regu-

larly sprinkled with small dots, with a fine red cheek; stalk from one-half an inch to over an inch long, generally a little curved, and planted in a small, round cavity; calyx small, closed, in a shallow, generally smooth basin; flesh white, fine-grained, buttery, melting, with a rich, deli-

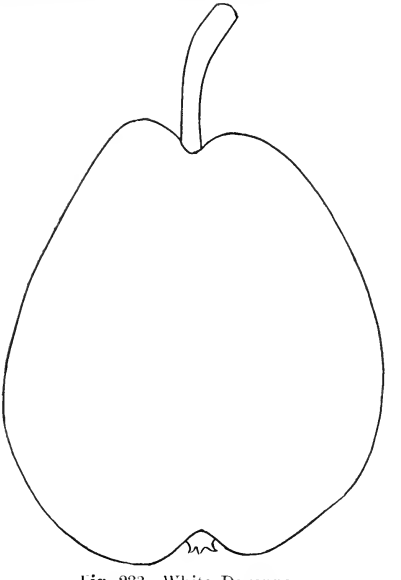


Fig. 233—White Doyenne.

cious flavor. Ripens—Georgia, in August; New York, September to December.

HENRY THE FOURTH, OR ANANAS D'ETE.—Fruit varies from the size figured to small, roundish pyriform, irregular, skin pale greenish-yellow, clouded with darker green, and dotted with gray specks; stalk about an inch long, twisted obliquely, planted on an irregular prominence, or under a swollen lip; calyx small, closed; basin shallow

and abrupt; flesh white, exceedingly juicy and melting, with a pleasant perfumed flavor; a dull fruit externally, but a nice dessert pear, bearing abundantly, and continuing to ripen several weeks. Ripens—Georgia, from the 20th of July into September; New York, September.

SELLECK.—Fruit varies from obovate to obtuse-pyriform, somewhat ribbed; skin fine, rich yellow, thickly

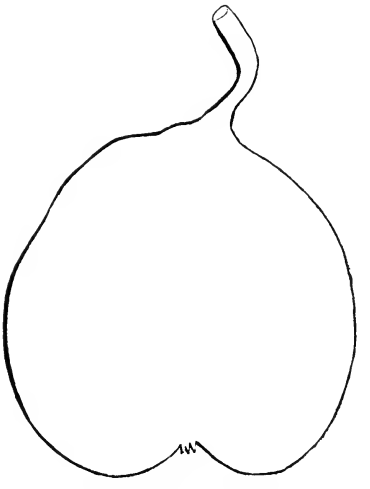


Fig. 234—Henry the Fourth.

dotted and sprinkled with russet, full russet about the base of the stalk; stalk long and curved, fleshy at its insertion in a moderate cavity; calyx partly closed, in a small, uneven basin; flesh white, firm, juicy and melting, sugary, with a rich, aromatic flavor; keeps well without decay at the core; a very valuable sort. Ripens in Georgia, 20th of August; New York, in September.

Van Assche.—Tree vigorous and fruitful, with reddish-brown shoots and plump buds; fruit medium, or large, turbinate, inclining to conical, in very large specimens oblate; skin light yellow, with numerous russet and red dots, with a bright red cheek; stalk an inch long,

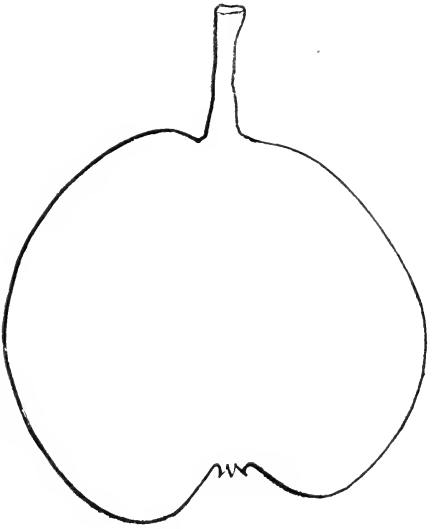


Fig. 235—Selleck.

rather stout, obliquely planted in a slight depression; calyx partly closed, in a broad, deep, and wrinkled basin; flesh white, fine-grained, juicy, with a delicate blending of sweet and acid, and a rich, excellent flavor. Ripens—August in Georgia; October, in New York. Generally larger than the engraving.

Duchesse d'Angouleme.—Fruit very large, obovate, varying from oblong to oblate, with a knobby, uneven surface; skin dull greenish-yellow, dotted and spotted

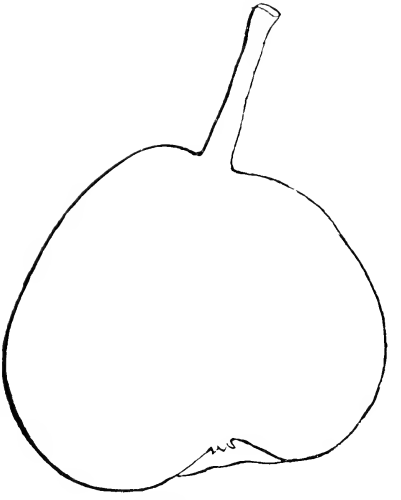


Fig. 236—Van Assche.

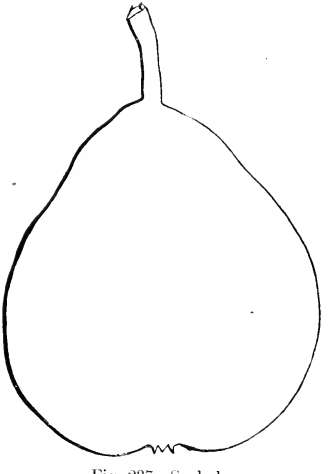


Fig. 237—Seckel.

with russet; stalk about an inch long, quite stout, set with an inclination in a rather deep cavity; calyx closed, set in a narrow, somewhat knobby basin; flesh white, buttery, very juicy, with a rich, sugary flavor. Excellent for so large a pear. Brings the very highest prices in market. Ripens—Georgia, the latter half of August into September; New York, in October. From France.

SECKEL.—Fruit small, generally obovate; skin at first brownish-green, at last becoming yellowish-brown, with a bright red, russet cheek; stalk half to three-fourths of an inch long, slightly curved, set in a slight depression; calyx small, open, in a very shallow basin; flesh whitish, buttery, very fine-grained and melting, filled with rich, sugary, aromatic juice. Ripens—Georgia, the last half of August and into September; New York, September and October. Tree of slow growth, but remarkably healthy and productive. Origin—Philadelphia. This is by many considered, and perhaps justly, the very best variety of pear.

CLAIRGEAU.—Fruit large, pyriform, with unequal sides; skin warm yellow, inclining to fawn, thickly sprinkled with large, yellow dots, with russet tracings and spots, shaded with orange and crimson; stalk short and stout, often fleshy, and inserted by a lip at an inclination, or in an uneven cavity; calyx open, with stiff segments; flesh yellowish, buttery, very melting and juicy, with a sugary, vinous flavor. Ripens—Georgia, September to October 10th; New York, October to January. A beautiful fruit, often so much larger and broader than the cut, that it could not be figured on this page. Tree vigorous, and an early and profuse bearer.

LUCRATIVE.—Fruit medium, obovate to obscure pyriform; skin pale yellowish-green, with dots and traces of russet; stem varying from short, stout, and fleshy, to more

than an inch long, often obliquely inserted in a slight cavity; calyx open, in a medium basin; flesh fine-grained, melting, full of rich, sugary, and delicious juice. Ripens—Georgia, in August; New York, last of September. A

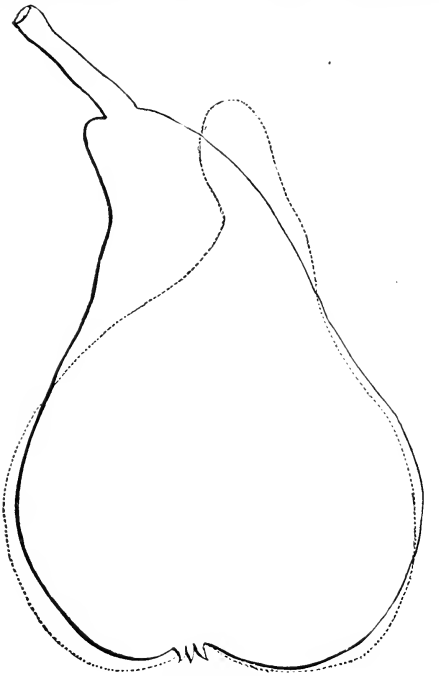


Fig. 238—Clairgeau.

Flemish variety. Tree of moderate growth, very fruitful, and bears young; one of the very best.

ARCHANGEL.—Fruit above medium size, obovate-pyriform; skin smooth, shining, greenish-yellow, sprinkled with russet dots; stalk an inch long, inclined, fleshy at

its insertion, and surrounded by russet; calyx small and closed; basin small and uneven; flesh yellowish-white, tender and melting, abundant in sugary juice, with an agreeable perfume; an excellent fruit. Tree healthy, vigorous and fruitful. Ripe—Georgia, last of August; New York, October.

STERLING.—Fruit medium, and varying from oblate to obovate, or obscure pyriform; skin yellow, with a few russet patches, and a mottled crimson cheek; stalk medium, inserted in a slightly plaited cavity; calyx small,

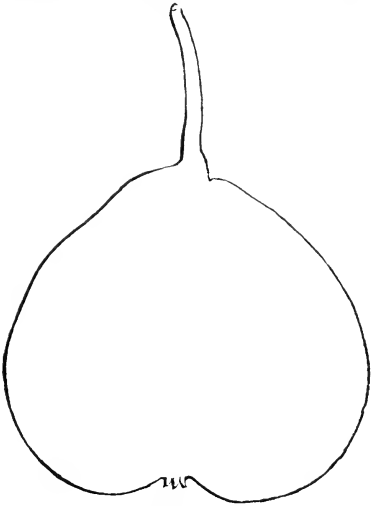


Fig. 239—Sterling.

open, in a medium basin; flesh somewhat coarse, juicy, melting, with a sugary, brisk flavor. Ripens—Georgia, July 15th; New York, the last of August. Keeps a long time after gathering, and is an excellent fruit to send to a distant market. Very desirable. Tree vigorous and up-

right, with yellowish-brown wood. An early and productive bearer.

Passe Colmar.—Fruit large, varying from obovate to obtuse-pyriform; skin rather thick, yellowish-green, turning yellow when mature, a good deal russeted about the eye and at the base of the stalk; stalk rather long, often fleshy at its base, inserted in an uneven cavity; calyx open, in a slight, regular basin; flesh yellowish, fine, melting and juicy, with a sweet, rich, aromatic flavor. A rapid grower and profuse bearer, but if the fruit is not well thinned, it will be small and astringent. Georgia, October and November; New York, December.

Glout Morceau.—Fruit large, varying in form from obovate to obtuse-pyriform, and often depressed somewhat; skin pale greenish-yellow, marked with small dots, russeted about the stem, with a brownish cheek on the more exposed fruits; stem long, slender, in a slight cavity; calyx mostly open, in a rather deep basin; flesh white, fine-grained, very melting, juicy, sugary, and perfumed. A fine, pyramidal, healthy grower, and quite fruitful. Georgia, October and November; New York, December.

Josephine de Malines.—Fruit medium, truncate, obconic; skin yellowish, somewhat russeted, especially about the base and crown, and sprinkled with russet dots; stalk long, stout, curved, inserted in a moderate, russet-lined cavity; calyx small, open, with caducous segments, in a slight basin; flesh greenish-white, buttery, very juicy, sugary, melting and perfumed. An excellent keeper. Georgia, October to January, and has been kept until March; New York, November, and through the winter. Tree productive and vigorous.

Belle Epine Dumas (Duchess de Bordeaux).—Fruit medium or large, long-pyriform; skin green, becoming greenish-yellow as it ripens, with small brown dots, and

at the South is generally somewhat marked with russet about the base and stem; stalk long, rather stout, curved a little, swollen at the base, inserted in a slight depression; calyx small, partly closed, in a shallow, regular basin; flesh white, fine, melting, juicy, rich, sugary, and

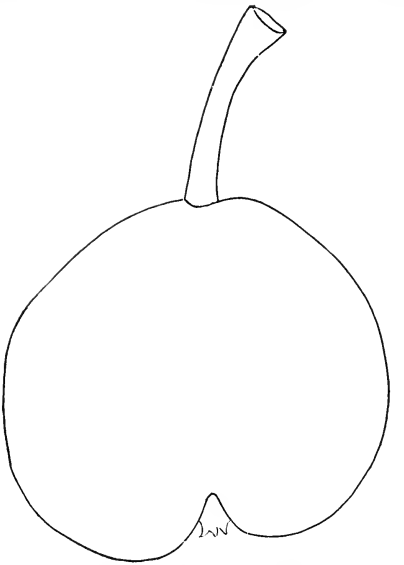


Fig. 240—Josephine de Malines.

perfumed; core medium, with large, long, pointed seeds. Georgia, October; New York, November and December.

PARSONAGE.—Fruit medium or large, obovate, inclining to obtuse-pyriform; skin warm yellow, rough, often shaded with dull crimson, netted and thickly dotted with russet; stalk short, stout, curved, fleshy at its insertion; calyx open, with short, stiff segments, in a russeted, shallow basin; flesh white, somewhat coarse, granular,

sugary, and refreshing. In Georgia it has kept until November. Tree fruitful and healthy.

COLUMBIA.—Fruit large, oblong-obovate, or pyriform, often simply obovate, broadest in the middle; skin smooth, pale green, turning yellowish when ripe, with a

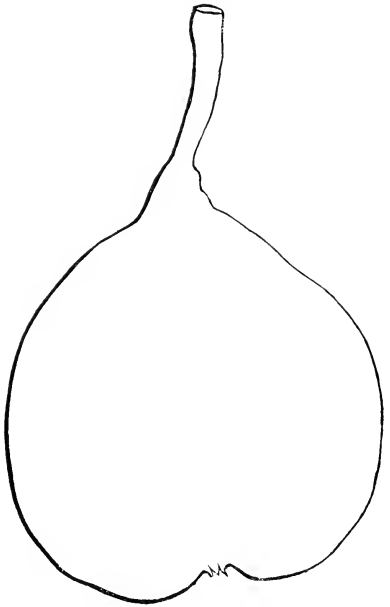


Fig. 241—Columbia.

soft brown cheek, dotted with russet, with a little russet also about the stalk and calyx; stalk about an inch long, rather stout, slightly curved; calyx small, partly closed, in a shallow basin; flesh white, fine-grained, melting and abundant in rich, sugary juice. Ripens in Georgia from the 15th of August to the last of September, and is not

excelled by any other pear; in New York, November, and is said to be variable there, but generally fine.

ST. GERMAIN (Pound).—Fruit large, irregular, oval-pyriform, tapering to the eye and stalk; skin yellowish-green, a good deal covered with russet, with a brown cheek; stem stout, swollen at its insertion, generally planted obliquely by the side of a small, fleshy swelling; calyx small, open, in a very shallow basin; flesh yellowish-

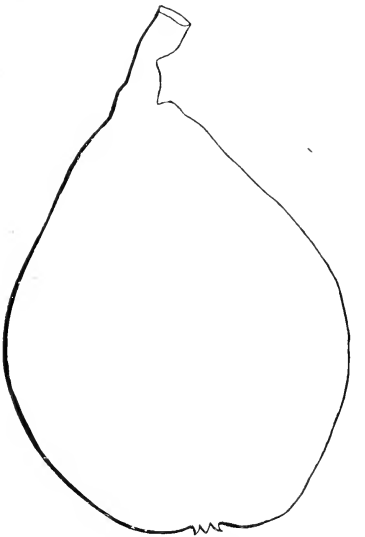


Fig. 242—St. Germain.

white, a little gritty, melting, juicy, rich and sugary. Georgia, October and November; New York, November and December. This is one of the most desirable pears grown at the South. Tree healthy and productive, and the smallest fruits always of excellent flavor.

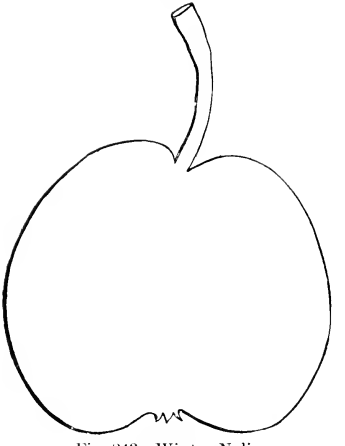


Fig. 243—Winter Nelis.

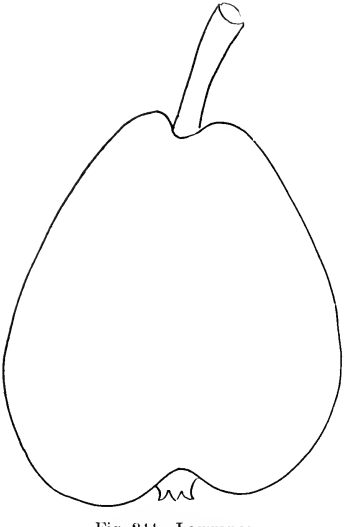


Fig. 244—Lawrence.

WINTER NELIS.—Fruit medium to small, varying from oblate to roundish obovate; skin yellowish-green, but generally a good deal covered with russet; stalk an inch long, curved, and planted in a narrow cavity; calyx open, in a shallow basin, with stiff, short segments; flesh pale yellowish-white, fine-grained, buttery and melting,

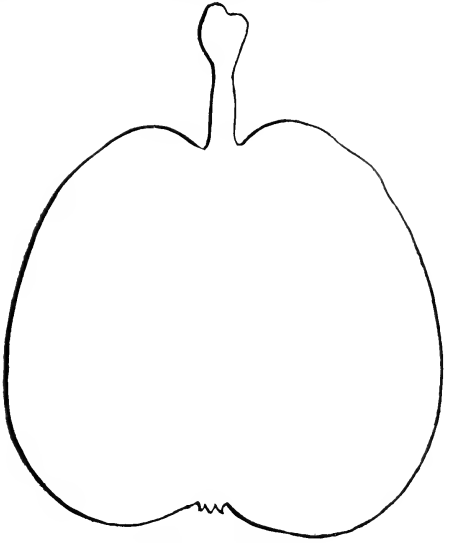


Fig. 245 –Easter Beurre.

abounding in rich, sugary, aromatic juice. Ripens—Georgia, in October; New York, December.

LAWRENCE.—Fruit large, obovate, obscurely pyriform; stalk rather short, inclined, inserted by a lip or in a slight, regular depression; cavity generally partly closed, in a broad, shallow basin; skin fine lemon yellow, uneven, sprinkled thickly with small dots; flesh white, a little granular, buttery, with a very rich, sugary, aromatic

flavor. Georgia—September 20th to October 20th; New York, November to January. Tree of moderate growth, very healthy; an early and abundant bearer. Far the most desirable pear of its season.

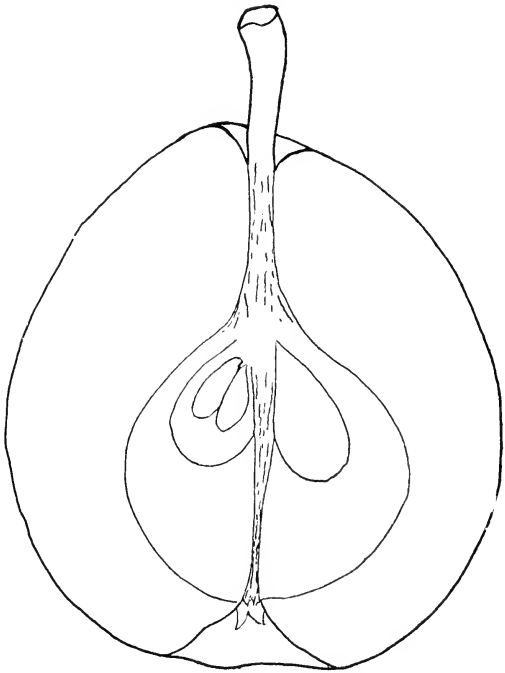


Fig. 246—LeConte Pear (after S. H. Rumph).

Easter Beurre.—Fruit large, obovate or obtuse-pyriform; skin yellowish-green, sprinkled with large russet dots, and marbled somewhat with greenish-russet; stalk rather stout, in abrupt cavity; calyx usually small, closed, in a plaited basin; flesh white, fine-grained, but-

tery, juicy, and sweet. Georgia, November to March; New York, January to May. Succeeds best on quince.

JAMINETTE (Josephine).—Fruit large, varying in form from obovate, narrowing to the stalk, to oblate; skin green, turning to pale yellowish-green when ripe, dotted with brown, and marked with russet; stalk rather short,

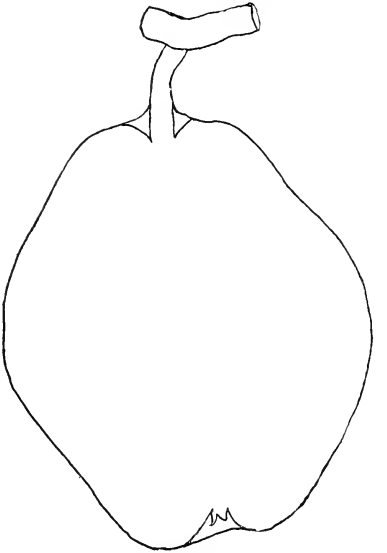


Fig 247—Kieffer Pear (after S. H. Rumph)

obliquely planted in a slight depression (in obovate specimens without depression), and surrounded with russet; calyx small, open, in a slight basin; flesh white, a little gritty at the core, juicy, buttery, and sweet. A good fruit, but must be eaten as it begins to soften, or will be found decayed at the core. Georgia, October.

LECONTE.—This is a vigorous grower, and well adapted to South Georgia, Florida and the coasts of

Alabama, Louisiana and Texas. The fruit is very large; skin smooth and light yellow. The tree is prolific, and ripens its fruit in July.

KIEFFER.—This is one of the best pears for cooking purposes. It is said to be a seedling of the LeConte or

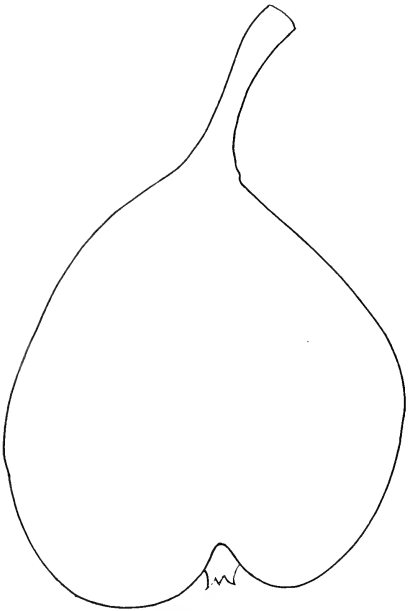


Fig. 248—Superfine.

Chinese sand pear. It is a very popular fruit in South Georgia and Florida. A productive and valuable late pear. To secure the best results with this pear it should be grafted on a LeConte or Japan pear stock.

The Georgia Horticultural Society in the proceedings

for 1896 recommends the following grouping of the varieties of pears for market in the order of maturity:

On Quince Stock.—Giffard, Archangel, Superfine, Howell, Duchesse d'Angouleme, Seckel, Buerre d'Anjou.

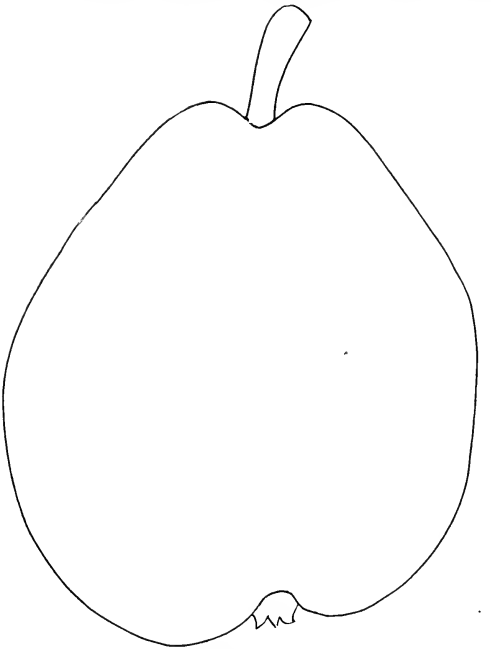


Fig. 249—Anjou.

Superfine.—This pear originated in France. The fruit is round pyriform, of a yellow-crimson russet color, and of a butter-melting texture; the flavor is vinous. The fruit is medium quality.

Anjou.—Obtuse pyriform shape; rather above medium in size; color greenish-crimson; quality good, and tex-

ture melting, with a perfumed vinous flavor. The fruit ripens at a medium date.

HOWELL.—This pear originated in Connecticut. The fruit is a yellowish-red color; vinous, juicy flavor, and it is a good dessert and market variety.

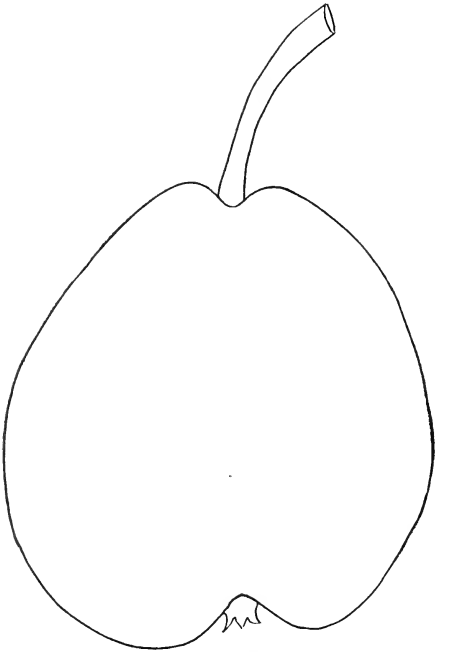


Fig. 250—Howell.

GARBER.—This is a seedling of the Chinese sand pear, and is very popular in many portions of the South. It ripens between the dates in which the LeConte and Kieffer pears mature, and therefore in those orchards

where the three varieties are found, a succession of fruit is obtained. The tree bears young and abundantly.

ON STANDARD.—Doyenne d'Ete, Clapp's Favorite, Bartlett, Lucrative, LeConte, Flemish, Clairgeau, Lawrence, Kieffer, Easter, and Winter Nelis.

ORIENTAL TYPE.—Mikado, Garber, Mme. Von Siebold.

The Smith pear is highly endorsed by the Florida Horticultural Society as equal to the LeConte in its vigor and productiveness, and having the advantage, perhaps, in earliness and quality.

Pears suitable for Middle Virginia, Western North Carolina, North South Carolina, North Georgia, Northeast Alabama, Middle Tennessee:

Angouleme, Duchess de,	Lawrence,
Anjou,	Giffard,
Bartlett,	Garber,
Bloodgood,	Louise Bonne de Jersey,
Bosc,	Lucrative,
Brandywine,	Madeleine,
Clairgeau,	Malines, Josephine de,
Columbia,	Seckel,
Easter Beurre,	Summer Doyenne,
Howell,	Superfine,
Kieffer,	White Doyenne,

Winter Nelis.

Pears suitable for Eastern Virginia, Eastern North Carolina, southern half of South Carolina, southern half of Georgia, all of Alabama except the northeastern portions, Mississippi, Southern Arkansas, North Louisiana, and Eastern Texas:

Angouleme, Duchess de,	Lawrence,
Garber,	LeConte,
Kieffer,	Seckel.

Pears suitable for Southern Louisiana and Florida:

Garber,	LeConte,
Kieffer,	Smith.

MARKETING.—The fruit must be gathered before fully ripe, because otherwise it will be too mellow for shipping properly. It will ripen sufficiently in transit. Pack in the same manner recommended for apples, in half-bushel crates, or, if the crop is a large one, in barrels. Face up as directed for appl

PERSIMMON.—*(Diospyros.)*

AMERICAN PERSIMMON OR DATE PLUM (*D. Virginiana*, L.).—This tree is very common in its wild condition throughout the South, and, not until within recent years, has any systematic effort been put forth to improve the fruit by cultivation.

In its wild condition the fruit of the persimmon varies greatly in size and flavor. Some are large and more or less pleasant to the taste, while others are quite small and varying also in the degre of palatableness. Within recent years a number of improved varieties have been developed by experimenters, until now we have more than a dozen excellent forms which produce fruit of superior quality. The following are some of the best, described by the Pomological Division of the United States Department of Agriculture and the Indiana Experiment Station:

DANIEL BOONE.—The fruit is roundish oblate; yellow, with a dull blush in the sun. Skin rather tough and seeds numerous; quality good, though not so rich as some other varieties. Season, October and November. Tree handsome, productive, and a vigorous grower, with very large, thick leaves.

EARLY BEARING.—This was introduced by James Little, Cartersburg, Hendricks county, Indiana. Fruit, round-ovate; medium to large; dull yellow and of good quality. Ripens earlier than Daniel Boone, and, though smaller, is a more desirable variety. The tree is a good grower, early bearer, and very productive.

Fig. 251—Daniel Boone. Reduced. Indiana Agricultural Experiment Station Bulletin 60.

EARLY GOLDEN.—Oblong, medium to large, rich yellow color, very sweet, and of excellent quality; skin thick and seeds few in number. Ripens in September without frost. Twigs and under side of leaves covered with whitish down. Tree productive and handsome. Introduced from Illinois.

GOLDEN GEM.—Roundish or slightly oblong; medium to large in size; color dark red orange to red; seeds few; flesh soft, very sweet and rich; free from astringency, even if picked before fully ripe. Commences to ripen about the last of August and continues till October. This variety was brought to notice by Mr. Logan Martin, of

Fig. 252—Early Bearing. Reduced. Indiana Agricultural Experiment Station Bulletin 60.

Borden, Indiana, who found the original tree on his farm thirty-five years ago. He has propagated from this by budding, and now has more than three hundred trees, including top-worked wild and young trees growing in the nursery. He reports that the persimmon pays him better than any other fruit.

HICKS (synonym Superior).—Originated by E. H. Trueblood, Indiana. A choice native variety, the trees of which have been propagated and their fruit marketed locally for many years. Size medium; color dull, grayish red; seeds somewhat numerous, of medium size; flavor sweet and rich, free from astringency when fully ripe;

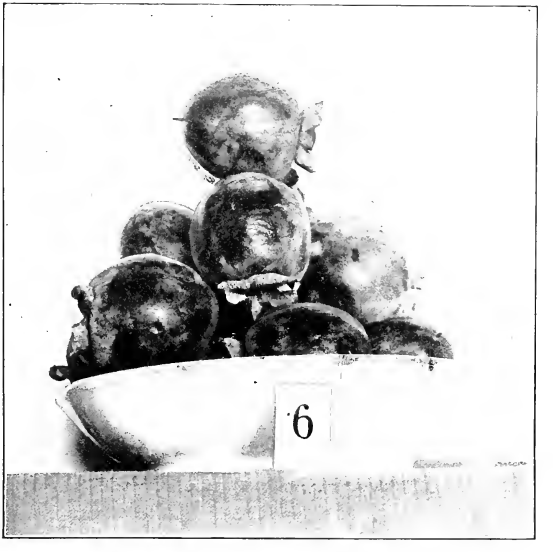


Fig. 253—Golden Gem. Reduced. Indiana Agricultural Experiment Station Bulletin 60.

very good. Specimens of the fruit of this variety, dried in the shade without sugar, were found to be of excellent quality, and almost equal to imported dates. Mr. Hicks reports that the fruit begins ripening early and continues for a period of six weeks, and that the tree is very productive. The orignal tree has not failed to fruit annually for the past twenty-five years.

KEMPER.—We have not ascertained the history of this variety, but learned from a report of the Division of Pomology, United States Department of Agriculture, that it was originated in Tennessee, and is one of the best varieties thus far named and introduced.

KANSAS.—This was introduced from Missouri. The fruit is roundish, slightly oblate; rather large; splashed with red on yellow ground; flesh tender, rich, and highly flavored. Season, September. The tree is productive and is very handsome in general appearance.

MARION.—Originated by Samuel Miller, Missouri. This native persimmon is a large, handsome fruit, with few seeds, ripening in October. The original tree was found growing near Fulton, Missouri, on land owned by J. H. Marion, and is said to have larger leaves and blossoms than the common persimmon.

SHOTO.—This variety was introduced by A. C. Chambers, Danville, Hendricks county, Indiana. The fruit is oblong-ovate, slightly conical; large to very large; color dull yellow, with blush in the sun; rather tough skin and few seeds; quality very good. Season, October. Tree an early bearer, productive, and a vigorous grower. The original tree began bearing at three years of age.

SMEECH.—Fruit, roundish-oblate; medium size; dull yellow, with red splashes; superior quality, being very rich and sweet. Tree a good grower and productive. Introduced from Pennsylvania.

Propagation.—The persimmon grows readily from seed, but there is no certainty that fruit, even equal to that produced by the original tree, will be obtained. It is therefore best to graft on the common wild stock in early spring. The splice or cleft method of grafting can be used with success. The stock should be healthy and from one to two inches in diameter. For a description of these

methods of grafting the reader is referred to the chapter devoted to this subject. The trees should be planted in the orchard with ample space to allow for future growth and expansion. Twenty to thirty feet will not be too much space between the trees and between the rows.

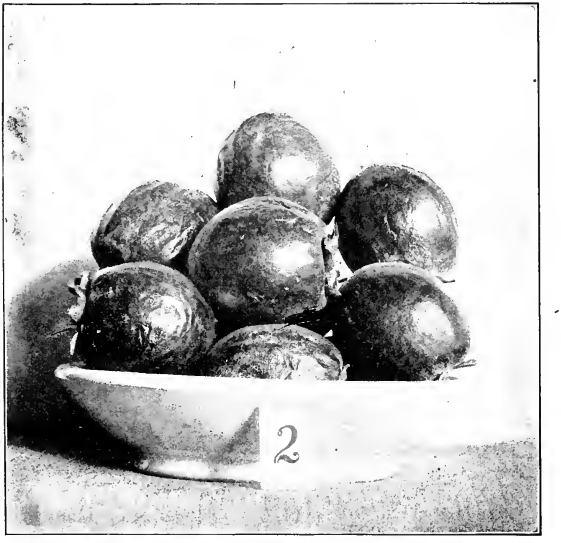


Fig. 254—Shoto. Reduced. Indiana Agricultural Experiment Station Bulletin 60.

Frequent cultivation by plowing and harrowing will improve the condition and growth of the trees.

JAPAN PERSIMMON (*D. kaki*).—This species of the persimmon was introduced into the United States a number of years ago from Japan, and it is well known among all horticulturists throughout the country. The trees grow to a remarkable degree of perfection in the South, and

the fruit is larger and superior in quality to the American species.

In its propagation and cultivation the same methods are used as practiced with the American persimmon. When grafted on the native plant the Japan persimmon

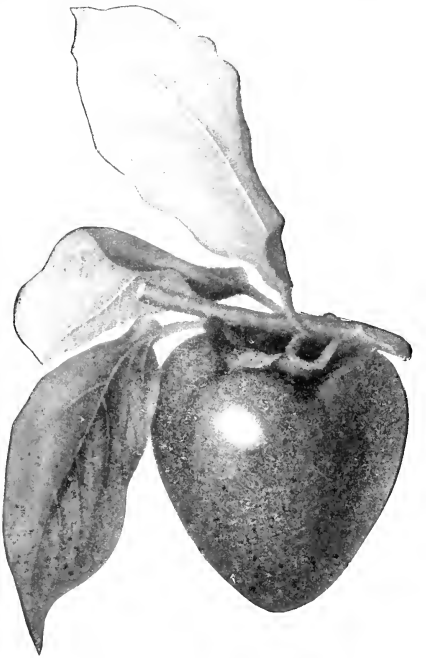


Fig. 255—Costata Persimmon. Div. Pomology, U. S. Dept. Agri.

becomes peculiarly suited to the South, and it is doubtful whether any other section of the country can produce the fruit of equal perfection in quality. There are few enemies known to attack it, and it is a very prolific and vigorous tree. The character of the fruit varies consider-

ably with the varieties. Some produce dark flesh, while others give a lighter shade in color. These two classes also differ in taste. The dark flesh kinds may be eaten with relish before they are quite ripe, and there is not the unpleasant astringent taste detected in the light flesh colored kinds before fully ripe. Of course all fruit of the persimmon becomes much improved when completely matured. The dark flesh kinds also give more seeds that the light flesh varieties. Some of the latter are termed seedless.

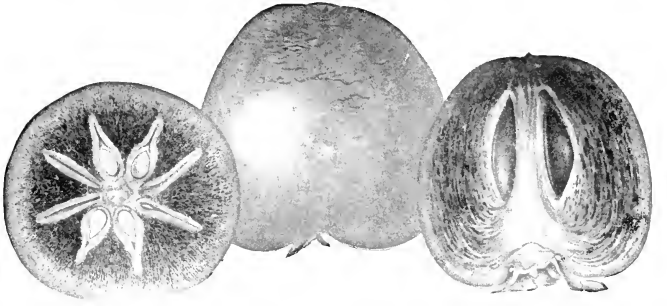


Fig. 256—Hyakume Persimmon. Div. Pomology, U. S. Dept. Agri.

The best varieties of the Japan persimmon are as follows:

COSTATA.—Size above medium, salmon red, round conical pointed, quality fair, ripens late. The flesh is light yellow, with very few seeds. The fruit will keep a long time after pulled from the tree. Tree vigorous and rather ornamental with broad leaves.

HACHIYA.—Very large, weighing as much as ten ounces; obovate pointed, dark red with deep yellow flesh, few seeds and an astringent taste until fully ripe. Fruit ripens early; good grower, but rather shy bearer.

HYAKUME.—Rather large, but not the size of the last;

round obovate, orange red, quality good and ripens near the middle of the season. The flesh is yellow in color, and the fruit is a good market variety.

Fig. 257—Okame.

OKAME.—Large fruit, dark red on the skin and round oblate. Good quality and medium early in ripening. This is not a favorite market variety, because of the difficulty

in getting all of the fruit to ripen uniformly, but it is highly prized for home use because of the long season, the beauty and fine quality of the fruit. It is called one of the seedless varieties.

TANENASHI.—This is one of the best in flavor of all the Japan persimmons. The fruit is large, round conical

Fig. 258—Yeddo-ichi Persimmon.

pointed, brown in color, and the flesh an orange yellow. This is an excellent market variety.

YEDDO-ICHI.—This is also an excellent fruit in quality; medium size, round oblate, dark red, flesh mahogany brown, with dark spots. The tree is upright and a prolific bearer.

YEMON.—With some authorities this fruit stands third

in the degree of excellency. The astringency in this fruit disappears as it begins to soften; it is a large fruit, round conical pointed, skin salmon red and flesh deep red. The tree is vigorous and productive.

ZENGI.—One of the earliest to ripen, and is edible from the middle of September until the latter part of October. The flesh is dark brown and the quality is good. This is one of the seedy varieties.

Fig. 259—Zengi Persimmon.

MARKETING.—The persimmon should not be marketed until the astringency has been destroyed by the fruit being fully ripe. Many of the varieties can be picked before entirely ripened and housed in a well-ventilated place until the ripening is completed, when they may be packed in baskets used for strawberries. When the fruit is left on the trees until after frost strikes it the keeping qualities are greatly reduced, but if it is gathered before frost and just before fully ripe the fruit will generally keep for a month. A little experience will determine this point with accuracy.

PINEAPPLES.—(*Ananassa sativa.*)

There are at least twenty varieties of the pineapple cultivated in Florida, but the following are considered to be the standard forms.

CAYENNE (smooth).—Conical form, above medium in size, yellow color, best quality in taste. The plant produces broad leaves, almost free from spines, which is a great advantage in its cultivation. It does not yield slips, and it is therefore difficult to propagate.

EGYPTIAN QUEEN.—Fruit medium size, conical, yellow color; excellent quality. This plant is also cultivated for market purposes, but on a limited extent.

PERNAMBUCO.—Rather small, oblong, yellow in color, and of excellent quality.

PORTO RICO.—Is a general favorite; the fruit is large, round, yellow with a good flavor, but not equal to the last two. The plant is robust and produces well; it is an excellent shipping fruit. The plant forms an abundance of suckers and slips.

RIPLEY QUEEN.—Medium size, conical, yellow in color, and very good quality.

RED SPANISH.—Also called "Black Spanish," "Havana," "Strawberry," "Scarlet Key," etc. It is generally cultivated for the market, although it is not equal to the other varieties in flavor. It is, however, hardy, easier to cultivate and stands the varying conditions better. The size of the fruit is medium, round, yellowish red in color.

In propagating the pineapple several methods are used.

1. From suckers, which grow near the base of the plant.

2. From "rattoons," which are the buds below the surface of the ground shooting up into suckers.

Plate 16—Palm Beach Pinery.

3. From slips produced by buds just under the fruit.
4. From the crowns at the top of the fruit.
5. From seeds.

The suckers, either from the buds above or below the ground, are strong and vigorous. The rattoons are generally left on the parent plant to grow to maturity without transplanting. These will usually fruit in about one year. The suckers from the buds above ground are broken off and transplanted. The slips are smaller than the suckers, and are more abundant on the parent plant. These slips are also broken off after the fruit is harvested, and after they mature, which may be determined by the brown color of the stem at the base, and they are transplanted. Fruit is produced by the slips in about two years. Propagating by slips is the usual method practiced by the Florida growers, because it is thought that better fruit is produced than that obtained from suckers. The crown is generally shipped with the fruit when it is sent to market, so that this method of propagating is seldom adopted. Reproduction by planting the seed is resorted to sometimes when it is desired to develop new varieties.

In planting the soil must be well prepared and cleared of all weeds and trash. The plants are set out in beds 18x20, 20x22, or 30x36 inches apart, depending upon the size of the plant. The offsets are prepared by trimming and smoothly paring a few of the lower leaves to encourage the rapid formation of roots. Plant at least three inches deep in the soil in the case of suckers, and about two inches in the case of slips. July, August and September are the months in which the transplanting is done. An acre generally holds about 9,000 plants.

The fertilizer used is one rich in nitrogen. This may be secured in cottonseed-meal or fish guano, applied at the rate of 1,000 or 1,500 pounds per acre. Florida soft

phosphate, kainit or potash salts and cottonseed-meal will make a good fertilizer.

Cultivating under open sheds is now practiced in some portions of Florida, and strong claims have been made concerning the merits of the system. It is claimed that the fruit matures sooner, is larger and better flavored than when grown in the open field. The moisture is not so rapidly evaporated, and the soil is therefore kept in better condition. These sheds are covered with slats 1x3 inches and 18 feet long, separated 3 inches, so that sunlight can enter. The north and west sides are boarded up.

MARKETING.—The fruit is gathered just before ripe by breaking from the plant, care being taken not to bruise it. It is taken to the packing-house and cooled. The stem is neatly trimmed, and the entire fruit is wrapped in paper. The crown is not cut off. The style of crate used is what is known as barrel or half-barrel crates. In the first eight to ten pineapples are packed, and the latter is used to ship the fancy varieties of fruit.

PLUM.—(*Prunus.*)

The plum tree is probably a native of Asia, whence it was early introduced into European gardens. The tree grows from fifteen to twenty feet high, and is conspicuous early in spring for its white blossoms.

Loudon asserts that probably the natural color of the fruit is black; but the cultivated varieties are of various shades of green, yellow, red and blue. It is a delicious dessert fruit, in its best varieties, and is very much esteemed for pies, tarts and preserves.

It is also dried for winter use. The prune, or dried plum, enters considerably into commerce. When fully ripe, plums are, in moderate quantity, very nutritious

and wholesome, but in an unripe state are more apt to disagree with the stomach than most other fruits.

Prunes are dried by artificial heat. They are laid singly, without touching each other, on plates, which are placed in ovens, after the bread is removed, or in kilns prepared for the purpose, and occasionally moved and turned. In order to have them fair and glossy, they must be suddenly cooled when taken from the oven. They should be dried carefully and gradually. They are excellent when dried with sugar, as directed for peaches. From the analysis of the stones, bark, leaves and wood, it is evident that common salt is one of the most essential manures to apply to the soil in which the plum is cultivated. Burnt clay, swamp muck, common salt, and wood ashes are among the best fertilizers.

Propagation and Culture.—The plum is generally budded or grafted upon stocks raised from the seed of some free-growing variety. The Chickasaw plum, however, makes a very good stock; it should be grafted at the collar, and transplanted so deep that the scions can throw out roots. This stock makes very pretty dwarf trees for the garden. By this mode, the tree can be propagated at any time during the winter months.

Stone fruits require to be grafted early in the season. In transplanting where they are to remain they should be twelve feet apart. The best soil for the plum is a heavy clay loam, moderately rich. As the plum throws out long, straggling branches, which are unsightly and unproductive, this should be remedied by shortening in, as with the peach, so as to form a round, compact head. Most stone fruits require to be shortened in, more or less, or the growth becomes unsightly and the tree short-lived. It is an excellent plan, where practicable, to plant a tree or two near the door of the house and kitchen, where there is considerable passing and repassing, and the

ground becomes hard-trodden. Such trees are less infested by the great enemy to stone fruit—the curculio—which is quite a timid, as well as cunning, insect.

SPECIES.—There are seven distinct species of the *Prunus* grown in this country, viz.: *Prunus Americana*, or native group; *Prunus angustifolia*, or Chickasaw group; *Prunus hortulana*, or wild goose group; *Prunus domestica*, or European group; *Prunus cerasifera*, or Marianna group; *Prunus triflora*, or Japanese group; *Prunus pumila*. A great many varieties have been developed from these species, some of which have been cultivated in the Southern States for a long period of time.

VARIETIES.

Prunus Angustifolia.

CADDO CHIEF.—Fruit red, oval, small; ripens about the middle of May.

LONE STAR.—Fruit red, oval, small; ripens in middle summer; quality fair. This plum originated in Texas.

NEWMAN.—Fruit rather large, oval, yellow, quality very good; ripens in Middle Alabama from July 8th to August 25th. The tree is low and spreading.

YELLOW TRANSPARENT.—Originated in Texas; good market plum; fruit large, oval, yellow, and it ripens early.

Prunus Hortulana.

CUMBERLAND.—Fruit average size, round, yellow in color and sweet flavored. Originated near Augusta, Georgia, from seed secured in the Cumberland Mountains. The fruit ripens about the latter part of August.

GOLDEN BEAUTY.—An excellent plum which was originated in Texas. The fruit is round-ovate, dark yellow, medium late.

WILD GOOSE.—A cling stone variety, sweet and good quality, small, round and purple in color. Ripens early in June, and is an excellent market plum.

MISSOURI.—Fruit rather large, round and deep yellow. Excellent quality. Late.

Prunus Domestica.

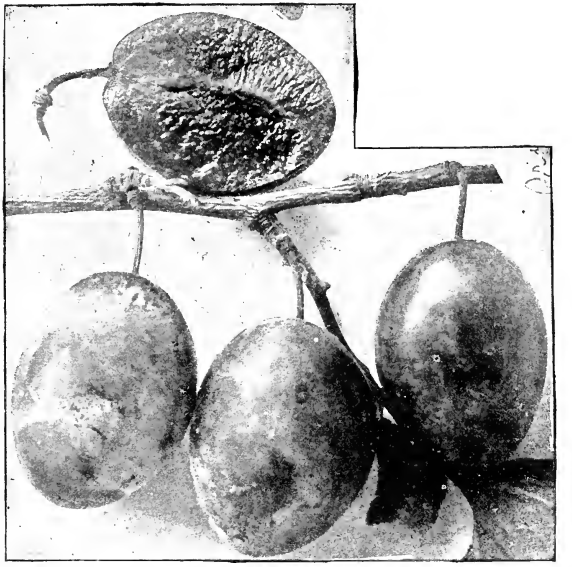


Fig. 260—German Prune (after Bailey). *Prunus domestica.* Cornell Experiment Station Bulletin 131.

BINGHAM.—Fruit large, oval; skin deep yellow, spotted with red toward the sun; stalk in a small cavity; flesh yellow, juicy, rich and delicious; clingstone; tree a fine grower and good bearer. Ripens July 1st.

COLUMBIA.—Very large, roundish; skin brownish-pur-

ple, with fawn-colored specks; bloom thick and blue; stalk an inch long, stout, in a narrow cavity; flesh orange, not very juicy, sugary, rich, and excellent; freestone. Ripe June 20th. A magnificent variety, of excellent quality. Tree hardy and productive.

DAMSON (French Damson, Free Damson, Purple Damson, Blue Damson).—Fruit small, oval and purple, with a decided bloom. Flavor rather acid. Very productive. Suitable for cooking. Late.

DUANE'S PURPLE.—Branches downy; fruit very large, oblong, swollen on one side of the suture; skin reddish-

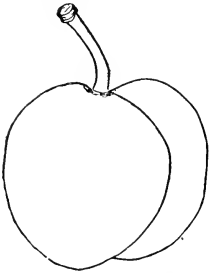


Fig. 261—Green Gage.

purple in the sun, paler in the shade, dotted sparsely with yellow specks, and covered with lilac bloom; stalk slender, of medium length, in a narrow cavity; flesh amber-colored, juicy, sprightly, moderately sweet, adhering partially to the stone. Ripe—Georgia, July 10th; New York, August 10th, with the Washington.

GREEN GAGE.—Fruit medium size; freestone; ripens in August.

JEFFERSON.—Fruit of the largest size, roundish oval; stalk an inch long, pretty stout; suture distinct; skin golden yellow, purplish-red on the sunny side, and thinly covered with white bloom; flesh deep orange, a little dry,

good; not equal to the description in the books. As the tree bears abundantly, and the fruit ripens late, hangs long on the tree, and is entirely free from decay, it is indispensable. The handsomest of all plums. Ripens last of July and first of August.

IMPERIAL GAGE.—Fruit large, oval, greenish-yellow;

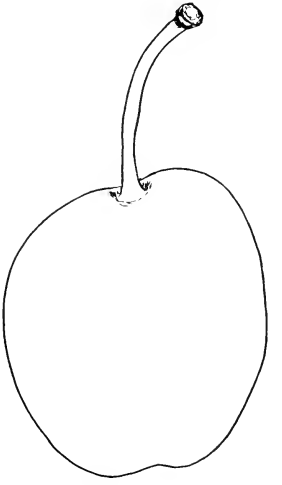


Fig. 262—Jefferson.

quality excellent. Ripens in July, and it is very productive.

LOMBARD.—Fruit medium size, round-ovate, violet red in color, flesh yellow; good quality. This plum is adapted to light soils, and it is an early, productive variety.

PRINCE'S YELLOW GAGE.—Fruit medium size, broadest toward the stalk; suture slight; skin golden yellow, slightly clouded, and with copious white bloom; stalk an inch long, inserted in a small cavity; flesh deep yel-

low, sweet, juicy, and fine flavored; freestone; tree very productive; fruit lasts a long time. One of the best for a long time in this climate. Ripe June 10th.

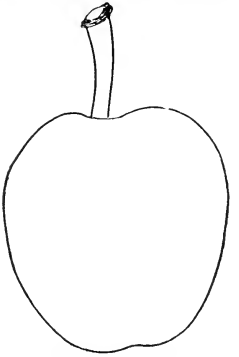


Fig. 263—Imperial Gage.

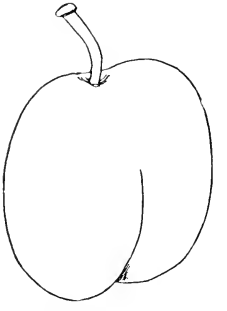


Fig. 264—Lombard.

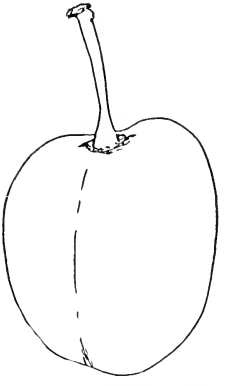


Fig. 265—Prince's Yellow Gage.

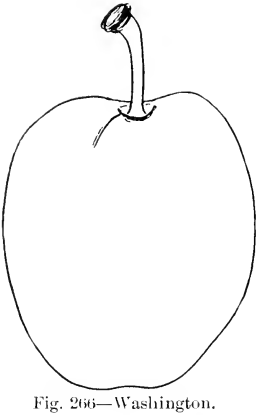


Fig. 266—Washington.

Red Magnum Bonum, or Purple Egg.—Large and beautiful; egg-shaped; violet red, deeper in the sun, with

small gray dots; flesh greenish, rather firm, juicy, and agreeably subacid; freestone. A fair plum for the table, and makes the best of preserves. Ripens July 10th. Not much subject to rot.

RIVERS' EARLY FAVORITE.—Fruit medium, or a little below, roundish oval, with a shallow suture; stalk very short; skin deep blackish-purple, sprinkled with russet dots, and covered with a thin, blue bloom; flesh greenish-yellow, very juicy, sweet, of excellent flavor, separating freely from the small stone; shoots slender, slightly downy. Ripens—Georgia, June 15th to 30th; New York, August 1st. An excellent, early, dessert plum, following immediately the Jaune Hative. Productive.

WASHINGTON.—Tree vigorous; leaves large, broad, glossy and rumpled; wood light brown; fruit very large, roundish oval; suture shallow, except at the stalk; skin pale greenish-yellow, faintly marbled with green, changing at maturity to darker yellow, with a bright blush in the sun; stalk short, in a shallow, wide cavity; flesh yellow, firm, sweet, and luscious; stone pointed, and separates freely. Ripens—Georgia, early in July; New York, the latter half of August. This is one of the most attractive and desirable varieties in all sections.

Prunus Cerasifera.

DECARADEUC.—This plum ripens early in June, and is sweet and juicy. The fruit is round, medium size, yellow, with brown red tinge.

Prunus Triflora.*

These plums have become very popular within the past ten or fifteen years, and many varieties have been developed from the original species. The propagation is

*The illustrations accompanying the descriptions of the Japan plums are by Prof. L. H. Bailey, of Cornell University Experiment Station.

accomplished by budding on stocks of the Marianna plum of the *cerasifera* species, or on peach roots. The following represent some of the best varieties:

ABUNDANCE, OR YELLOW BOTAN (similar to Chase).—

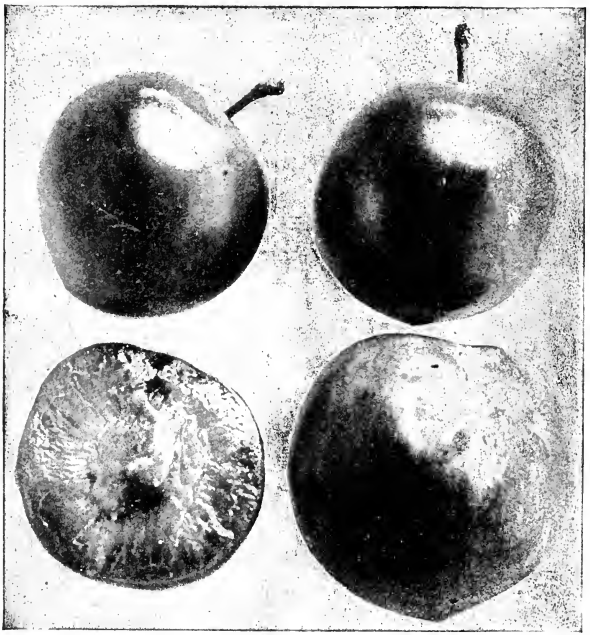


Fig. 267—Japanese Plum. Abundance (after Bailey). Botan. Cornell Experiment Station Bulletin 106.

One of the best of the group, and more widely planted than, possibly, any other species. It ripens its fruit in the latter part of June. The fruit is round-ovate, above the average size, brownish-red in color, with yellow

ground, flesh yellow. Thinning the fruit increases the size.

BERCKMANS, OR SWEET BOTAN.—Named in honor of Mr. P. J. Berckmans, of Augusta, Georgia. The fruit is large, green in color, with a dull purple hue. Freestone and good quality. Ripens the latter part of June.

BURBANK.—The fruit is round and above medium size,

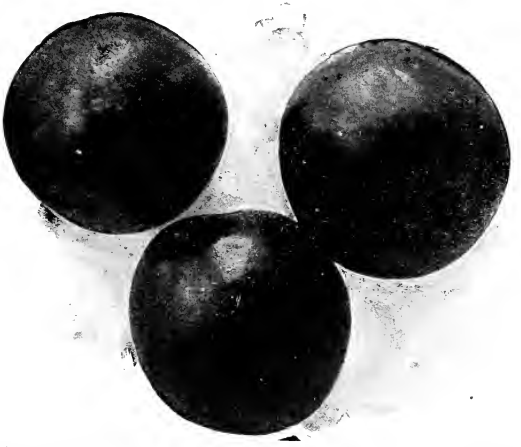


Fig. 268—Japanese Plums. Berckmans (after Bailey). True Sweet Botan. Sweet Botan. White Flesh Botan. Botan. Cornell Experiment Station Bulletin 139.

purple yellow. Ripens the latter part of July. The tree has a spreading habit.

CHABOT (Bailey, Yellow Japan, Chase).—The fruit is medium size, round-ovate, red tinged with purple. Follows Burbank in ripening towards the end of July. The flavor is somewhat acid. Clingstone.

LOUISIANA (Normand, No. 15).—This plum originated

with Mr. J. L. Normand, of Marksville, Louisiana; it is a hybrid of the Japan and native plum.

KELSEY.—A very large plum, round-ovate, yellowish-red, excellent flavor and juicy. Semi-clingstone, pit

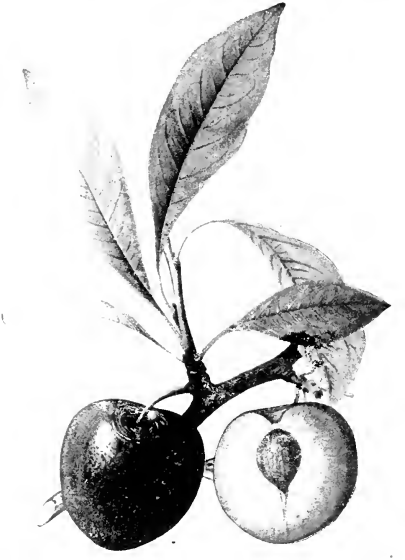


Fig. 269—Burbank Plum. Division of Pomology, U. S. Department of Agriculture.

small. Ripens from the middle of July to the end of August. One of the best Japan plums.

KERR (Hattankio, 2).—Fruit ovate, yellow in color and average size; fine flavor, juicy and subacid; clingstone. Ripens about the middle of June.

NORMAND.—Fruit rather above medium, round, inclining to heart-shaped, skin and flesh yellow, with fine

flavor. Freestone. The tree grows to a symmetrical shape.

RED JUNE AND RED NEGATE.—By some authorities these two forms are pronounced to be the same, but they

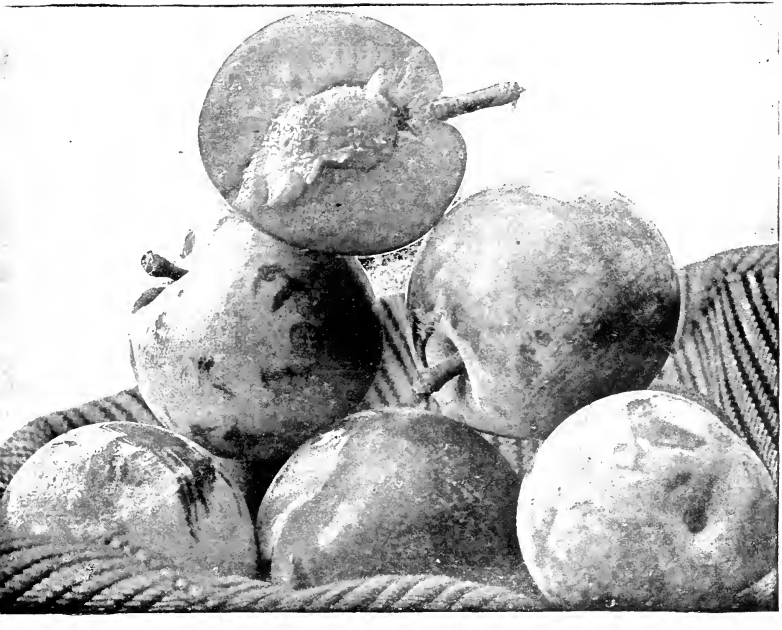


Fig. 270—Japanese Plum. Chabot (after Bailey). Bailey. Yellow Japan. Chase. Cornell Experiment Bulletin 106.

are sold by the nurserymen as distinct varieties. The Red June produces a fruit of average size, heart-shaped, dark red, with a decided bloom, making a handsome plum. This is a fine early variety. The tree is a vigorous grower, and very productive.

SATSUMA.—Sometimes called Blood plum, because of the dark red color of the fruit. Size average to above medium, round to broad conical. The flavor is excellent.

Plums suitable for Middle Virginia, Middle North Carolina, Northern South Carolina, Northern Georgia, Northeastern Alabama, and Middle Tennessee:

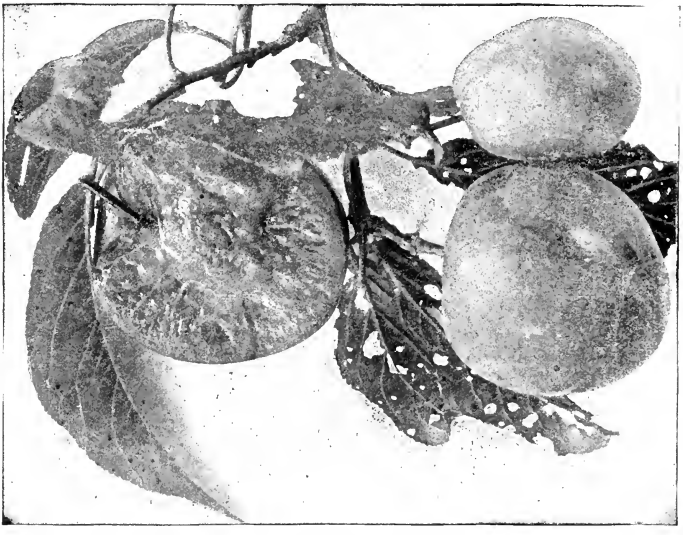


Fig. 271—Japanese Plums. Louisiana (after Bailey). Normand No. 15. Cornell Experiment Station Bulletin 139.]

Abundance,	Duane Purple,
Green Gage, or Bavay,	Imperial Gage,
Burbank,	Jefferson,
Chabot,	Kerr (Hattankio, 2),
Columbia,	Lombard,
Damson,	Newman,

Prince Yellow, Satsuma,
Red Negate or Red June, Washington,
Wild Goose.

Plums suitable for Eastern Virginia, Eastern North

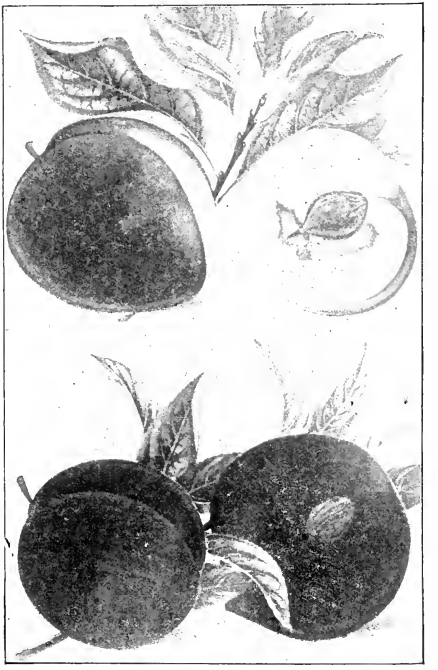


Fig. 272—1. Kelsey Plum. 2. Satsuma Plum.
(Div. Pomology, U. S. Dept. Agri.)

Carolina, Southern South Carolina, Southern Georgia, all of Alabama except the northeastern portions, Mississippi, Southern Arkansas, Western Tennessee, Northern Louisiana, Eastern Texas:

Abundance,
Berckmans,
Burbank,
Caddo Chief,
Caradeuc de,
Chabot,
Cumberland,
Georgeson (Hattankio),
Golden Beauty,
Kerr (Hattankio, 2),
Lone Star,
Newman,
Red Negate,
Satsuma,
Transparent, Yellow,
Wild Goose.

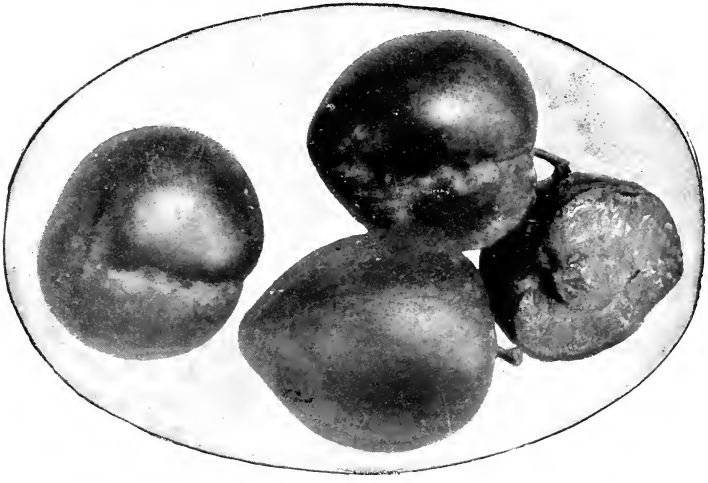


Fig. 273—Japanese Plum. Red June (after Bailey). Shiro-Smono. Cornell Experiment Station Bulletin 106.

Plums suitable for Southern Louisiana and Florida:

Babcock,
Berckmans,
Burbank,
Kelsey,
Satsuma,
Wild Goose.

MARKETING.—Pick the fruit just before ripe, so that it will not decay in transit. The ripening will take place

soon enough before reaching market. Pack carefully either in climax maskets or in 24-quart strawberry cases. It is best to use smaller cases than usually adopted in shipping other fruit, but one-third bushel crates will

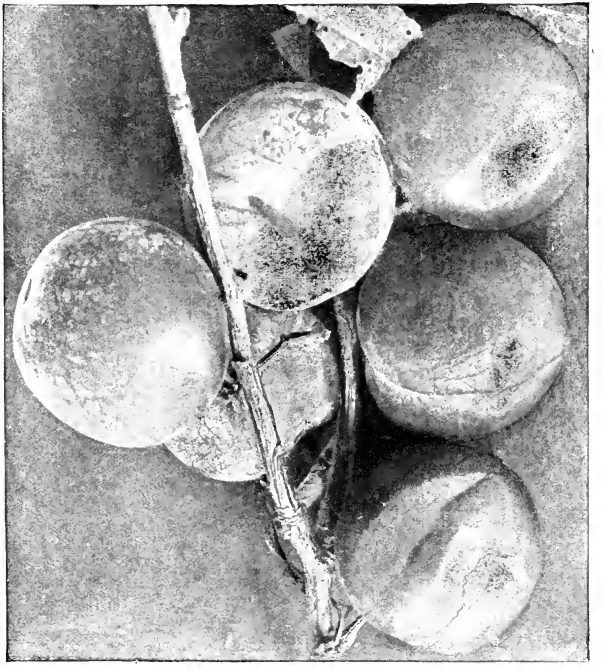


Fig. 274—Japanese Plum. Georgeson (after Bailey). Hattankio No. 1. Hattankio. Cornell Experiment Station Bulletin 106.

serve very well if the plums are firm and in good condition. Pack firmly, so that there will be no shifting of the fruit during its transit to market, because the bruising will soon cause it to rot; moreover, the packages present

a much more attractive appearance when the plums are packed firmly and neatly in the baskets or crates. The shipment should be quick and prompt.

POMEGRANATE.—*(Punica Granatum.)*

This plant is generally grown for ornament, although some people like the fruit. There are five varieties, viz.:

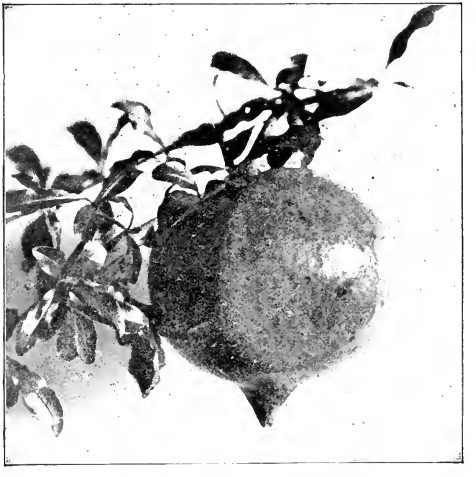


Fig. 275—Pomegranate (Acid).

Acid, Dwarf, Purple, Sweet and Violet. The plant makes an attractive addition to the lawn or yard because of the beautiful orange red flowers and the large yellow apple-shaped fruit. The fruit has such a large quantity of seeds it is difficult to eat, but a pleasant, cooling drink is made by bruising the seeds in a glass of water and sweetening with sugar.

The plant is propagated by seeds, cuttings or layers.

It is hardy in all sections of the Gulf States south of a line drawn through Middle Alabama.

QUINCE.—*(Cydonia vulgaris.)*

The Quince is a small, hardy tree, seldom growing over twelve to fifteen feet in height; thickly branched; with ovate leaves, whitish underneath, on short petioles; the flowers are white or pale pink color, and the fruit appears on shoots of the same year's growth, varying in shape, but having a resemblance to that of the apple or pear. It is, when ripe, highly fragrant, and of a fine golden yellow color, making the tree quite ornamental. Quinces are seldom eaten raw, but for baking, stewing, preserving, marmalades, or pies, along with apples, they are much esteemed. They are also dried for winter use, giving an excellent flavor to dried apples and peaches.

For these purposes the quince has been long in cultivation, having been in great esteem among the Greeks and Romans. The mucilage from the seeds was formerly used in medicine instead of gum-water. The quince is propagated from seed, layers, slips or cuttings, and grows very readily from the latter. Cuttings, if planted about the time the buds commence swelling in the spring, rarely fail to grow. Quinces usually reproduce themselves from seed, but occasionally vary. Quince stocks are very much used for budding the pear upon, for which the Angers quince is preferred, although we have found the common or apple-shaped equally good in every respect. The quince likes a deep, moist soil and cool exposure, growing naturally upon the banks of streams. It, however, grows to admiration in any good, rich, friable soil, and no tree is more benefited by manuring, especially with vegetable manure. Salt is said to act beneficially if applied during winter. If applied occasionally in small doses at a dis-

tance from the trunk, the fruit will not drop; plant the trees ten feet apart.

The quince is subject to the blight, like the pear, and is also attacked by the borer which infests the apple; the blighted portion must be cut off and burned, as with the pear. The borer must be dug out.

The best fruit is obtained from those trained in the form of a tree, but on account of the borer it is best to use the bush form with three or four main stems, so if one is destroyed there are others left to take its place. Thus trained, the bush should be moderately pruned, or the fruit will be inferior. If there is an over-crop, the fruit should be thinned. The quince begins to bear when three or four years transplanted. Varieties:

Apple or Orange-Shaped.—This is the common variety, with large, roundish fruit, with a short neck; skin light golden yellow; flesh firm, but stews tender; leaves oval; shoots slender. If the core be cut out and the hole filled with sugar and baked, it forms a fine dessert dish.

Pear-Shaped.—Fruit large, pyriform, oblong, tapering to the stalk; skin yellow; flesh of firmer texture than when preserved, and not quite as good in flavor and color as the former. Fruit ripens a fortnight later, and when picked, keeps much longer; leaves oblong-ovate. Tree of more vigorous growth, but does not bear so well.

Portugal.—Fruit still more oblong, of lighter color, milder flavored, and of better quality than the preceding kinds; leaf larger and broader; shoots stouter; ripens between the other two; a shy bearer, pretty good as a stock for the pear. Tree larger than the other varieties.

Angers.—A variety of the last, the strongest grower of all the quinces, and much used for pear stocks. The fruit is said to be larger and better than any other kind.

CHINESE QUINCE (*Cydonia Sinensis*).—Leaves resemble those of the common quince in form, but have a glossy surface; the flowers are rose-colored, with a delicate fragrance, similar to that of the violet. The fruit is very large, oblong, and somewhat ribbed like a muskmelon; skin golden yellow; flesh hard and acrid, but is said to make a desirable preserve. A very beautiful shrub when in fruit.

THE RASPBERRY.—(*Rubus.*)

The Raspberry is a low, deciduous shrub, of which several species are common along the fences, both in Europe and America. The large-fruited varieties most esteemed in our gardens all originated from the long cultivated *Rubus Idœus*, or Mount Ida Bramble, which appears first to have been introduced into the gardens of the south of Europe from Mount Ida. It is now quite naturalized in some parts of the country. Besides this we have growing wild the common black and white raspberry, or Thimbleberries (*Rubus occidentalis*), and the red raspberry (*Rubus strigosus*), with very good fruit.

Uses.—The raspberry is held in general estimation, not only as one of the most refreshing and agreeable fruits for the dessert, but it is employed generally for preserving, jams, ices, sauces, tarts and jellies; and on a larger scale by confectioners for making syrups, and by distillers for making brandy. Raspberry wine is made in the same way as currant wine, and is considered the most fragrant of all domestic wines.

Propagation.—The raspberry is propagated by suckers or by dividing the roots. The seeds are planted only when new varieties are desired.

Soil and Culture.—The best soil is a rich, deep loam, rather moist than dry, provided it is not too much exposed to our hot Southern sun. The raspberry succeeds

best at the South when planted on the north side of a fence or building, but where it can have the morning sun; planted in the shade of trees it never does well. Give a good manuring every spring with well-rotted stable manure, and keep clear from grass and weeds with the hoe; prune out the old dead canes every spring. A fine late crop can readily be obtained by cutting over the whole stool, in the spring, to within a few inches of the ground. They will then shoot up fresh wood, which comes into bearing in August or September.

Varieties.—The finest raspberries in general cultivation for the dessert are the Red and White Antwerp, Cuthbert, Fastolf, Golden Queen, Orange, French, Franconia, Gregg, Philadelphia, Shaffer's Colossal, and Turner.

The common American Red is most esteemed for flavoring liquors, or making brandy and cordials; and the American Black is preferred by most persons for cooking.

The ever-bearing varieties are esteemed for prolonging the season of this fruit.

Red Antwerp (*R. Idaeus*).—This variety is also known as Old Red Antwerp, Knevett's Antwerp, True Red Antwerp, Howland's Red Antwerp, Burley, etc. It is the common Red Antwerp of England and America, and is quite distinct from the North River variety, which is shorter in growth, and has conical-shaped fruit. Canes strong and tall; spines light red, rather numerous, and pretty strong; fruit large, nearly globular, color dark red, with large grains, and covered with a thick bloom; juicy, with a brisk vinous flavor.

Fastolf (*R. Idaeus*).—One of the most vigorous of the foreign varieties, and does very well in Georgia. Fruit very large, roundish, conical, purplish-red; tender, rich, and high-flavored. Canes strong, erect, branching, with strong spines. The foregoing are all that we can recommend for Southern cultivation from personal experience.

The variety cultivated in the Northern States is very large; many of them we have tested here with but poor success.

CUTHBERT (*R. strigosus*).—This is one of the most desirable raspberries for the South. The fruit is red, large,

Fig 276—Gregg Raspberry (after Bailey). Natural size. Cornell Experiment Station Bulletin.

juicy and fine flavored. It ripens about the middle or latter part of May.

GREGG (*R. occidentalis*).—Fruit large round-ovate, black to dark purple. Ripens a short time before the Cuthbert. This is one of the best of the black-cap varieties. A favorite market variety.

GOLDEN QUEEN (*R. strigosus*).—An excellent summer variety; fruit is large and round-conical, yellow color; prolific and good flavor.

SCHAFFER'S COLOSSAL (*R. neglectus*).—This is one of the cap varieties. The fruit is very large, round, of a dull purple, with an acid flavor, and productive. A hardy plant for the dry summers of the South. Late and a good shipping fruit.

TURNER (*R. strigosus*).—A red raspberry and, like the last, suitable for the South, because it withstands the

Fig. 277—Golden Queen Raspberry.

hot summers admirably, and it produces fruit of excellent quality and beauty.

MARKETING.—The fruit must be packed in small baskets holding not more than a pint because in greater bulk the berries are easily crushed and ruined by their own weight. These pint boxes are then placed in cases holding twenty-four pints, with ample ventilation, so that the fruit will keep cool. Ship promptly and over the shortest routes, since the raspberry will not keep long after being gathered.

STRAWBERRY.—*(Fragaria.)*

The botanical name of the Strawberry is derived from the delightful fragrance of the ripe fruit. Its common name has arisen from the ancient practice of laying straw between the plants, to keep the ground moist and the fruit clean. This fruit is fragrant, delicious, and universally esteemed. The first offering of the season, in the way of ripe fruit, nothing that comes after it can excel "a dish of ripe strawberries smothered in cream," or fresh from the plant. It is, indeed, the most popular and wholesome of all the small fruits; for, besides its grateful flavor, the subacid juice has a cooling quality peculiarly acceptable in summer. In addition to its excellence for the dessert, it is a favorite fruit for making jams, ices, jellies, and preserves.

The English wood strawberry was the first brought into cultivation. Says old Tusser, turning over its cultivation to the ladies, as beneath his attention:

> "Wife, unto the garden, and set me a plot
> With strawberry plants, the best to be got,
> Such growing abroad, amid trees in the wood,
> Well chosen and picked, prove excellent good."

Plants taken directly from the field into the garden yield at once a tolerable crop. This climate is well adapted to the culture of this fruit, since by giving the plants a due supply of moisture, fruit can be gathered the greater part of the summer and autumn.

In its natural state, the strawberry generally produces perfect or hermaphrodite flowers; the hermaphrodite are those which have both the stamens and pistils so well developed as to produce a tolerably fair crop of fruit. Cultivation has so affected the strawberry in this respect, that there are now three classes of varieties. First, those in which the male or staminate organs are always per-

fect; but the female, or pistillate organs, are so defective that they will very rarely bear perfect fruit. Those are called staminate. Second, those in which the female, or pistillate organs, are perfect; but in which the male organs are generally so defective that they cannot produce fruit at all, unless in the neighborhood of, and fertilized by, staminate or hermaphrodite plants. Impregnated by these, they bear enormous crops. Third, those which, like the native varieties, are true hermaphrodites; that is, perfect in stamens and more or less perfect in pistils, so that they generally produce a tolerable crop,

Fig. 278.
Imperfect or Pistillate.

Fig. 279.
Perfect or Bisexual.

and, in favorable seasons, the pistils being fully developed, they will produce a good one.

This is called the staminate class in some books. The first of these classes, the staminate, rarely producing fruit, and running exuberantly to vine, should be dug up wherever found, since the hermaphrodite are productive, and equally useful for fertilizing. It is to the pistillate varieties, fertilized by the hermaphrodite, that we must look for large crops of fruit.

In beds of each of these varieties, seedlings will spring up, differing from the parents; but runners from any variety will always produce flowers of the same class and similar in all respects to the parent plant. By the due admixture of hermaphrodite and pistillate plants, five thousand quarts have been picked from an acre at Cin-

cinnati, where the strawberry season is usually less than a month.

Potash, soda and phosphoric acid are the elements most likely to be wanting in the soil. Wood ashes and the carbonates of potash and soda prove very beneficial applications.

Propagation and Culture.—To raise the strawberry in perfection requires good varieties, a proper location, careful cultivation, vegetable manure, mulching the roots, and regular watering.

The strawberry bed should be in the lowest part of the garden, succeeding best on a bottom near some little stream of water, where the soil is moist and cool; no trees or plants should be allowed to overshadow it, to drink up the moisture of the soil. New land is the best, and the most easily kept free from weeds. The soil should be dug or plowed deep.

It is not required to be very rich, unless with decayed vegetable matter, as animal manures produce only a growth of vine. Plant good, vigorous runners from old stocks, three feet apart each way; three rows of pistillates, and then one row of good hermaphrodites, and so on, until the bed or plot is filled; cultivate precisely as you would corn, and as often. As the runners appear, cut them off, and keep the plants in hills; this is a much better plan than to permit them to run together and occupy the entire surface of the ground; after the beds have done fruiting, still keep them clear from grass and weeds, and when the leaves fall from the trees in the fall, give a good coat of these as a winter protection.

There is no fruit which has been so greatly improved within the last few years as has the strawberry, in size, productiveness, and flavor; it is now as generally cultivated as the apple or any of our standard vegetables. Most of the then esteemed varieties are now superseded

by new and improved ones. The following represent some of the most desirable varieties for the South:

The following varieties are early strawberries:

Bubach (No. 5),	Hoffman,
Cloud,	Lady Thompson,
Crescent,	Meek,
Greenville,	Michel (very early).

The following varieties are medium in maturing:

Bederwood,	Haverland,
Captain Jack,	Jessie,
Cumberland,	Neunan,
Downing,	Parker Earle,
Enhance,	Sharpless,
	Wilson.

The following varieties are late strawberries:

Brandywine, Gandy, Eureka,

The following varieties are especially desirable for most sections of the South: Bederwood, Brandywine, Bubach No. 5, Crescent, Cumberland, Downing, Enhance, Gandy, Greenville, Haverland, Hoffman, Lady Thompson, Michel Early, Neunan, Parker Earle, Sharpless, Wilson.

The following are good market varieties, and will ship well: Bederwood, Bubach No. 5, Cloud, Crescent, Enhance, Gandy, Haverland, Hoffman, Lady Thompson, Michel, Neunan, Parker Earle, Wilson.

BUBACH, No. 5 (pistillate).—The plants are vigorous in some sections and weak in others. Leaf large, runners few, fruit large, irregular in shape, inclined to conical, light red; not a good shipper.

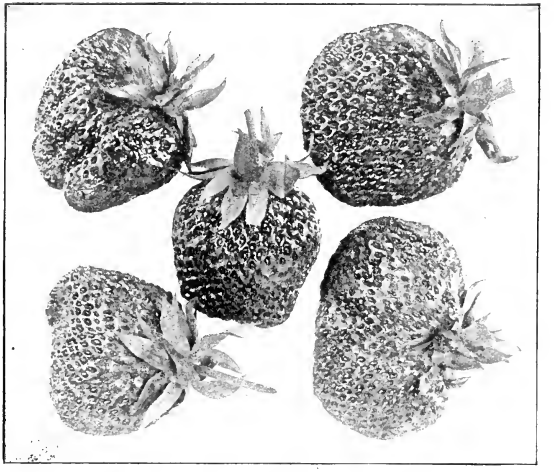


Plate 17—Jessie Strawberries.

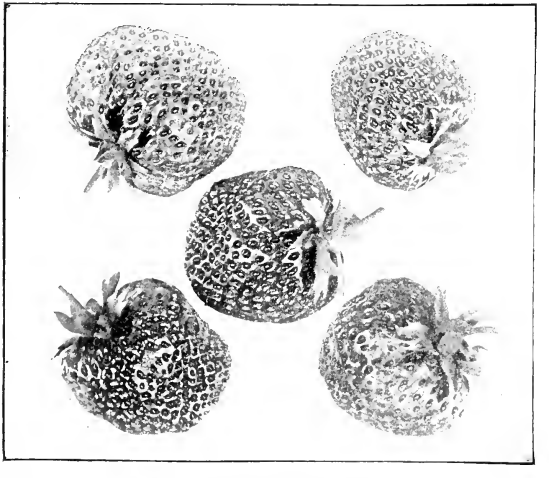


Plate 18—Bubach No. 5 Strawberries.
Photographs by R. L. Watts, Tennessee Experiment Station.

Varieties.

	Virgin	N. Carolina.	S. Carolina.	Georgia	Tennessee.	Florida.	Alabama.	Mississippi.	Arkansas	Louisiana.	Eastern Texas
Bederwood	*			*		*	*	*	*	*	
Belmont				*			*			**	
Brandywine	*	*	*	*	*	*	**	*	*	*	*
Bubach No. 5	*	**	*	**	**	*	**	**	**	*	*
Captain Jack						*	*	*	*	**	*
Cloud						**	*	**	*	*	**
Clyde	**										
Crescent	*	**	*	**	**	*	*	*	**	**	*
Cumberland	*	**	*	**	*	*	*	**	*	*	
Downing	*	**	*	*	*	*	*	*	*	*	*
Enhance	*	*	*	*	*	*	*	**	*	*	
Enormous	**										
Eureka	*	*	*	*	*		*		*	*	
Gandy	*	**	*	**	**	*	*	**	**	*	*
Greenville	*	*	*	*	*	*	*	*	*	*	*
Haverland	*	**	*	**	**		*	*	**	**	*
Hoffman		*	*	**	*	**	*	**	*	**	*
Jessie	*	*	*	*	*		*			*	
Lady Thompson	*	*	*	*	*	**	**	*	*	**	*
Meek's Early		*	*	*	*		*	*	*	*	*
Michel Early	*	*	*	**	**	**	**	**	**	**	**
Neuman		*	*	*		**	*	**	*	**	*
Parker Earle	*	**	*	*	*		*	*	*	*	**
Sharpless	*	**	*	**	*	*	**	*	**	*	*
Tennessee	**										
Wilson		**	*	**	*	**	**	**	*	*	*

* Successfully grown. ** Very successful.

CLOUD (pistillate).—A vigorous southern plant which resists drought well; fruit medium, firm, subacid and ripens evenly. Fairly good shipper.

CRESCENT (pistillate).—Vigorous plant with dark green foliage; fruit medium size, dull red; productive; many runners; stands dry weather well. A good shipper.

CUMBERLAND (hermaphrodite).—Few runners, injured by dry weather; leaf surface large and deep green; fruit large, excellent in flavor; too soft for shipment to distant points, but a good home berry; very prolific.

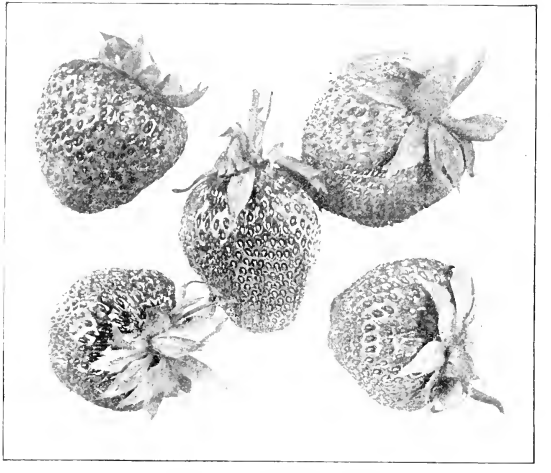
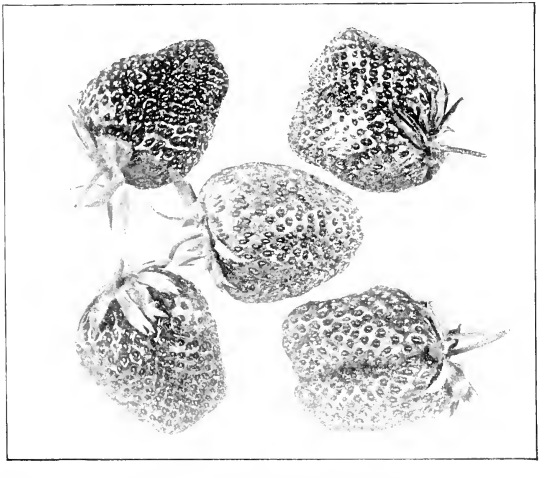


Plate 19—Gandy Strawberries.



(643) Plate 20—Haverland Strawberries.
Photographs by R. L. Watts Tennessee Experiment Station.

GANDY (hermaphrodite).—Some planters report this plant as "strong, vigorous with plenty of runners," others again say that "it is a weak grower, setting few runners." Fruit large and well shaped; ripens evenly; quality good and ships well. Popular in Mississippi.

HAVERLAND (pistillate).—Highly thought of in many sections. Leaves with long stems and dark green in color; vigorous and prolific. Fruit large with excellent flavor; color deep red; excellent market berry.

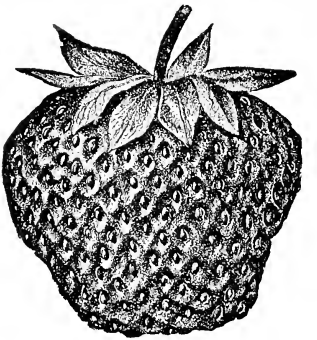


Fig. 280—Sharpless Strawberry.

HOFFMAN (hermaphrodite).—A southern type, vigorous in growth, with numerous runners; fruit long, medium sized; dark red and firm; acid taste. Productive and one of the best market varieties.

MICHEL'S EARLY (hermaphrodite).—A strong, healthy plant, with large leaves; many runners. Fruit medium size; excellent quality. Withstands heat and dry weather well.

SHARPLESS (hermaphrodite).—A good home berry, but not suitable for market purposes. Fruit of excellent quality, and very large and irregular in shape; dark red in color.

WILSON'S ALBANY (hermaphrodite).—This is a very popular strawberry, although not of first quality in flavor, being rather too acid, but as it is a very hardy variety, vigorous grower, and very productive, it will long be a favorite fruit for domestic cultivation. Fruit large, very dark red, conical in form, trusses short and stout; leaves large, dark green, with short petioles. An enormous bearer, and continues for a long time. One of the most desirable varieties. A standard sort.

MARKETING.—Pick the fruit with the stem attached, and gather it early in the morning, while the dew is on the plant; the fruit will stand handling much better in this condition than it will after the sun has risen and dried off the dew, causing the strawberry to soften. Transport to the packing-house, spread out to dry. Carefully assort, rejecting all fruit except the large and well-formed kinds. Pack in baskets firmly, but do not jam, and handle as little as possible, so that the "bloom" will not be destroyed. Select a reliable commercial house and ship the fruit direct to it; and endeavor to establish a good name by sending only the best fruit in the best condition.

CHAPTER XVII.

USEFUL TABLES AND FORMULAE.

The following pages contain a few tables and formulae which the practical gardener will find useful in the prosecution of his profession. This information has been culled from standard authorities, and can, therefore, be relied upon for accuracy.

Whitewash:

The following receipt for making whitewash is used by the United States Government for whitewashing the light-houses, and is almost as serviceable as paint. It gives a brilliant surface:

Slake with boiling water a half bushel of lime, cover during the operation to keep in the steam; after straining add a peck of salt, which has been dissolved in warm water; then add a thin paste made from three pounds of ground rice stirred in while hot; then add a half pound of Spanish whiting and one pound of glue previously dissolved in water. Add five gallons of hot water to the mixture, stir well, and allow to stand for a few days well covered. This whitewash must be applied hot.

Absorptive Power of Soils (Henderson):

100 pounds of pure clay absorbs.....70 pounds of water.
100 pounds of sand absorbs.....25 pounds of water.
100 pounds of clay loam absorbs.....50 pounds of water.
100 pounds of chalk absorbs.....45 pounds of water.
100 pounds of loamy sand absorbs.....40 pounds of water.
100 pounds of calcareous sand absorbs.....25 pounds of water.

Schubler's Experiment Shows that—

1,000 tons of pulverized soil will absorb moisture when exposed to the atmosphere, as follows:

Sandy clay .....26 tons.
Loamy clay .....30 tons.
Stiff clay .....36 tons.
Garden mould .....45 tons.

Amount of Land in Different Fields:

10 rods x 16 rods	1 acre.
5 rods x 32 rods	1 acre.
8 rods x 20 rods	1 acre.
4 rods x 40 rods	1 acre.
5 yards x 968 yards	1 acre.
10 yards x 484 yards	1 acre.
20 yards x 242 yards	1 acre.
40 yards x 121 yards	1 acre.
220 feet x 198 feet	1 acre.
110 feet x 369 feet	1 acre.
60 feet x 726 feet	1 acre.
120 feet x 363 feet	1 acre.
200 feet x 108.9 feet	½ acre.
100 feet x 145.2 feet	⅓ acre.
100 feet x 108.9 feet	¼ acre.
25 feet x 100 feet	.057 acre.
25 feet x 150 feet	.109 acre.
4356 square feet	.10 acre.

Number of Trees or Plants to an Acre (Henderson):

30 x 30	48	6 x 6	1210
25 x 25	69	5 x 5	1742
20 x 20	108	5 x 4	2178
19 x 19	120	5 x 3	2904
18 x 18	134	5 x 2	4356
17 x 17	150	5 x 1	8712
16 x 16	170	4 x 4	2722
15 x 15	193	4 x 3	3630
14 x 14	222	4 x 2	5445
13 x 13	257	4 x 1	10390
12 x 12	302	3 x 3	4870
11 x 11	360	3 x 2	7260
10 x 10	435	3 x 1	14520
9 x 9	537	2 x 2	10890
8 x 8	680	2 x 1	21780
7 x 7	888	1 x 1	43560

Composition of Vegetables and Fruits.

(DEPARTMENT OF AGRICULTURE.)

	WATER.	PROTEIN.	FAT.	NITROGEN-FREE EXTRACT.	ASH.
VEGETABLES:					
Asparagus	94 00	1 80	0 30	2 80	0 70
Beans (Lima)	68 16	7 15	0 69	20 30	1 69
Beans (String)	87 23	2 20	0 37	7 52	0 76
Beets (Red)	88 50	1 50	0 10	8 00	1 00
Beets (Sugar)	86.50	1 80	0 10	9 80	0 90
Cabbage	90.30	2 10	0.40	5 80	1 40
Carrot	88.20	1 10	0 40	9.20	1 10
Collards	87.10	4 50	0 60	6 30	1.50
Celery	94.50	1 10	0 10	3.30	1 00
Corn (Green)	75.40	3 10	1 10	19 70	0 70
Corn (Sweet)	81.25	2 81	1 10	13 67	0 66
Cowpea	14 80	20 75	1 44	55 72	3 22
Cauliflower	90.80	1 60	0 80	4 90	0 80
Cucumbers	96.00	0 80	0 20	1 80	0 50
Eggplant	92 93	1 15	0 31	4.34	0 50
Kohl-rabi	91 10	2 00	0 10	5 50	1.30
Lettuce	95 90	0 97	0 20	1 65	0 78
Mushrooms	88 10	3 50	0 10	6 80	1 20
Onions	87 60	1 40	0 30	9 40	1 10
Parsnips	83 00	1 60	0 50	13 50	1 40
Okra	87 41	1 99	0 10	6 04	0 74
Pumpkins	93 10	0 90	0 10	3 90	0 70
Radishes	91 80	1 30	0 10	5 80	1 00
Potatoes (Irish)	98 00	2 20	0 10	18 80	0 90
Potatoes (Sweet)	71 10	1 50	0 40	22 70	1 00
Peas (Green)	78 06	1 66	0 55	11 48	0 88
Rhubarb	94 40	0 60	0 70	3 60	0 70
Spinach	92.40	2 10	0 50	2 40	1 94
Squashes	88 10	0 90	0 20	9 10	1 70
Ruta-baga	88 60	1 20	0 20	7 50	1 20
Tomatoes	91.26	1 00	0 47	5.81	0 73
Turnips	90 50	1 10	0 20	6 20	0 80
FRUITS:					
Apples	84 11	0 21	0 28	11 26	0 23
Apricots	85 00	1 10		13 40	0 50
Bananas	66 25	1 41	1 35	28 88	1 15
Blackberries	88 91	0 94	2 08	5 04	0 58
Cherries	85 10	1 10	0 81	11 14	0 58
Cranberries	88 90	0 40	0 60	9 90	0 20
Grapes	77 10	1 20	1 60	19 20	0 50
Muskmelons	89 50	0 60		9 20	0 60
Lemons	89 30	1 00	0 90	7 20	0 50
Oranges	86 90	0 80	0 20	11 60	0 50
Pears	84 40	0 60	0 50	14.10	0 40
Persimmons	66 10	0 80	0.70	31.50	0 90
Pineapples	89 28	0 39	0 26	9 31	0 35
Plums	78 10	1 00		20 10	0 50
Pomegranates	76 80	1 50	1 60	19 50	0 60
Raspberries	85 82	0 99	1 00	12 60	0 60
Strawberries	90 80	1 00	0 70	5 50	0 60
Watermelons	92 40	0 40	0 20	6 70	0 30
Whortleberries	82 42	0 66	3 03	10.31	0 41
NUTS:					
Almonds	4 80	21 00	54 90	17 30	2 00
Butternuts	4.40	27 90	61 20	3 50	2 90
Chestnuts	45.00	6 20	5 40	42 10	1 30
Cocoanuts (Flesh)	14 10	5 70	50 60	27 90	1 70
Cocoanuts (Milk)	92 70	0 40	1 50	4 60	0 80
Filberts	3 70	15.60	65 30	13 00	2 40
Hickorynuts	3 70	15 40	67 40	11 40	2 10
Peanuts	9 20	25 80	38 60	24 40	2 00
Pecans	3 00	11 00	71 20	13.30	1 50
Walnuts (Black)	2 50	27 60	56 30	11 70	1 90

Distances Apart for Planting Fruits in Commercial Plantations (Year Book Department of Agriculture, 1897):

Apple	40 x 40
	33 x 33
	32 x 16
Apple (dwarf)	15 x 15
	10 x 10
Pear	24 x 24
	20 x 20
	16 x 16
Pear (dwarf)	16 x 16
	12 x 12
Quince	16 x 16
	12 x 12
Apricots	30 x 30
	25 x 25
	20 x 20
Cherries (sweet)	30 x 30
	24 x 24
	20 x 20
Cherries (sour)	20 x 20
	16 x 16
Peach	20 x 20
	20 x 16
	18 x 18
	13 x 13
Plum	20 x 20
	18 x 18
	16 x 16
Fig	40 x 40
	20 x 20
Kaki	20 x 20
Olive	25 x 25
	20 x 20
Orange and lemon	30 x 30
	25 x 25
Grape	8 x 10
	6 x 8
Almond	24 x 24
	20 x 20
Chestnut	40 x 40
	30 x 30
	20 x 20
Pecan	50 x 50
	40 x 40

Walnut	50 x 50
	40 x 40
Blackberries	6 x 8
	6 x 6
Raspberries	6 x 4
Currants and gooseberries	6 x 8
Strawberries	1 x 4
	1 x 3
	1 x 1
Cranberries	2 x 2

The distance suitable for fruit trees and plants in commercial plantations varies considerably in different regions. The more important factors in determining the proper distance for any given species are the fertility of the soil, the supply of soil moisture, the habit of growth and relative vigor of the varieties, and the necessity of providing sufficient space for operating spraying machinery in combating insects and fungi. Observation of local practice affords the safest guide in doubtful cases.

Time When Seed Should Sprout.

	Days.		Days.
Bean	5—10	Lettuce	5—10
Beet	7—10	Onion	6— 8
Cabbage	5—10	Pea	7—10
Carrot	12—18	Parsnip	6—10
Cauliflower	5—10	Pepper	10—20
Celery	10—20	Radish	9—14
Corn	5— 8	Salsify	3— 6
Cucumber	6— 8	Tomato	7—12
Endive	6—10	Turnip	6—12

Injurious Temperatures.

(W. W. Hammon in Weather Bureau Bulletin 23.)

Table of temperatures at which the following plants are liable to receive injury from frost, compiled from information received from horticulturists, orchardists, and gardeners throughout the entire Pacific coast

The temperatures given are, as nearly as possible, those of the air in contact with the plant itself.

Plants or Fruits.	In bud.	In blossom.	In setting fruit.	At other times.	Plants or Fruits.	In bud.	In blossom.	In setting fruit.	At other times.
Almonds	28	30	30	28	Onions				29
Apples	27	29	30	26	Oranges†	30	31	31	‖26 ¶29
Apricots	30	31	32	30	Parsnips				27
Asparagus	29	29	29	26	Peaches	29	30	30	29
Bananas	31	31	32	31	Pears	28	29	29	28
Barley		29			Peas	29	30	30	25
Beans		31			Plums	30	32	31	29
Beets				25	Potatoes:				
Cabbage				15–27	Irish	30	30	30	31
Cantaloupes	32	32		30–31	Sweet	31	31	31	31
Cauliflower				20–27	Prunes	30	31	31	29
Celery				28	Radishes				25
Cucumbers	31	31	31	32	Shrubs, roses, or trees	26–30	28–32		30–26
Cymlings or squash	31	31	31	30	Spinach				24
Flowers*	31	31	31	30	Strawberries	28	28	28	30
Grapes	31	31	30	28	Tangerines	31	31	31	28
Grape fruit	30	31	31	28	Tomatoes	31	31	31	31
Lemons	30	31	31	28	Turnips				26
Lettuce				12–28	Watermelons				28–31
Mandarins	31	31	31	28	Wheat		31	31	
Oats	31				Walnuts, English	30	31	31	28
Okra				31					
Olives	30	31	31	‖18 ¶24					

* Depends on variety. † Injured at 2° higher if continued four to six hours. ‖ Ripe. ¶ Green.

GARDEN CALENDAR.

Upper Sections.—Virginia, North Carolina, North Georgia, North Alabama, Tennessee.

Middle Sections.—Lower South Carolina, South Georgia, Middle and South Alabama, Mississippi.

Southern Sections.—Southern Louisiana and Florida.

JANUARY—*Upper Sections.*—Prepare hot-beds and cold frames and sow seeds of Cauliflower, Cabbage, Beets, Lettuce, Onions, Radishes. Prepare land for Potatoes.

Middle Sections.—Land made ready for English Peas and Irish Potatoes; later in the month sow Peas in open ground, also Radishes.

Southern Sections.—Sow Carrots, Beets, Leeks, Mustard, early Radishes, and Turnips. Sow in a frame Cabbage, Broccoli, Cauliflower, Endive, Kohl-rabi, Lettuce, Celery, Parsley, and Cress. In the hot-bed sow Eggplants, Pepper, and Tomatoes for early

transplanting. Sow Cucumber seeds in pots for forcing, transplant into hot-beds after the appearance of the third leaf. Plant Peas of the marrow fat and black-eyed varieties. Set out Cabbage plants sown in November. Onions should be transplanted early in this month, so that the bulbs will form soon.

FEBRUARY—*Upper Sections.*—Sow in hot-beds Cabbage, Cauliflower, Beets, Lettuce, Onions, Radishes, Eggplants, Pepper, and Tomatoes. Sow in open ground the latter part of the month Beets, Carrots, Celery, Kale, Parsley, Radishes. Set out Onion sets, Horse Radish, hardy Lettuce plants.

Middle Sections.—The early planting of Potatoes may now be accomplished. Sow early English Peas. The seeds mentioned in January for the Southern sections may be sown at this time for the Middle section.

Southern Sections.—Sow Beets, Carrots, Cabbage, Cauliflower, Leeks, Lettuce, Mustard, Parsnips, Kohl-rabi, the early varieties of Turnips and Radishes. Transplant Cabbage, Cauliflower. Divide Shallots and set out. Plant all varieties of Peas. Sow Asparagus seeds or plant the roots. Give plenty of air during the fair days to the hot-beds to prevent the plants from becoming too tender before transplanting. Towards the close of the month, if the weather will permit, early Corn can be planted and bush Beans. Melons and Squashes will do well if planted this month and protected by some covering against the cool nights.

MARCH—*Upper Sections.*—All kinds of hardy seeds may now be placed in the ground, such as Cauliflower, early Cabbage, Celery, Asparagus, Carrots, Leeks, Lettuce, Parsley, Parsnips, Onions, Peas, and Salsify. Sow under glass Eggplants, Pepper, and Tomatoes. Plant Irish Potatoes, Onion sets, Asparagus roots, and set out Cauliflower, Cabbage, and Lettuce plants from the hot-beds, after hardening. Prepare the land for early planting of Melons and Squashes.

Middle Sections.—All kinds of hardy seeds may be sown. Cauliflower and Cabbage plants should be transplanted. Shallots divided and set out. Sow Celery for seasoning, and also Parsley and Cress, Kohl-rabi and Turnips. Plant all varieties of Peas, and sow Asparagus or plant the roots, if not placed in the ground previously. As soon as the weather is favorable plant bush Beans, Cucumbers, Squash, and Melons, but protect the tender plants as they come up by the use of bell glasses or small boxes covered with glass. Near the close of the month plant Sweet or Sugar Corn, and also early Corn for the market.

Southern Sections.—This is the month for sowing bush and pole Beans, and, towards the end of the month, plant Lima Beans; plant, also, Cucumbers, Leeks, Mustard, Lettuce, Celery for cutting,

Parsley, Melons, Okra. Early varieties of Peas may be still planted. Set out, the last of the month, Tomatoes, Eggplants, and Peppers; plant Sweet Corn for continued crop.

APRIL—*Upper Sections.*—Sow in the open ground Cabbage, Tomatoes, and Lettuce, and plant early Irish Potatoes. Sow the seeds of Beets, Carrots, Asparagus, Artichokes, Celery, Onions, Parsnips, Radishes, Parsley, Salsify, Spring Kale. Set out Cabbage plants, Asparagus roots, and Onion sets. Plant early Corn, bed Sweet Potatoes, plant Peas, Snap Beans, and, towards the end of the month, Cantaloupes, Cucumbers, Melons, Squashes, and Strawberry plants.

Middle Sections.—Plant all varieties of bush and pole Beans, and, later in the month, Lima Beans also. Plant Cucumbers, Squashes, Okra, Early Peas; sow Lettuce, Celery for cutting, Radishes, Mustard, Carrots, Parsley; set out Eggplants, Tomatoes, and Peppers in the open ground.

Southern Sections.—Sow all kinds of Beans, Carrots, Cucumbers, Corn, Celery for cutting, Endive, Lettuce, Mustards, Melons, Parsley, Radishes, Squashes. Cauliflower may be sown this month, as it takes some time to mature, especially the Italian varieties.

MAY—*Upper Sections.*—Most garden seeds can be sown this month, such as Carrots, pole and snap Beans, Lima Beans, Corn, Cucumbers, Cantaloupes, late Cabbage seeds for setting out for fall use, Tomatoes, Salsify, Peas, Okra, Squashes, Pumpkins, Sweet Potato, and Eggplants.

Middle Sections.—Such kinds of garden seeds as Melons, Okra, Lima Beans, and Corn may be safely planted during this month. Set out Sweet Potatoes.

Southern Sections.—With the exception of Okra, the white and yellow summer Radishes and Endive, very few vegetable seeds are sown during this month. If the large white Celery is sown at this time it will be necessary to shade and water during the dry, warm weather. Special care in cultivation must be taken of the growing crops. Melons, Cucumbers, Squashes may be planted when the Onions and Potatoes are taken up.

JUNE—*Upper Sections.*—Cabbage, Eggplants, Peppers, Potatoes, and Tomato plants may be set out during this month. Sow late Cabbage and Cauliflower for winter use Plant late Potatoes for the winter. Plant Cantaloupes, Watermelons, Cucumbers, Squashes, Pumpkins, Sweet Corn, and Snap Beans.

Middle Sections.—Plant pole and snap Beans, Sweet Corn, Cucumbers for pickling, Cabbage for fall crop; Celery seed also sown now.

Southern Sections.—The growing crops will require all the attention of the gardener, and very few seeds will be sown during the

month. Corn may be planted for the late supply of roasting ears; some varieties of the hardy, prolific Beans and summer Radishes may be sown at this time; towards the end of the month Tomato seeds may be put in for the late crop. Plant Sweet Potato Vines.

JULY—*Upper Sections.*—Snap Beans and Sugar Corn may be planted for succession crops. Set out late Cabbage plants for winter use; also Celery plants. Sow Ruta Baga; plant Cucumbers for pickling and table use, and late Potatoes for winter.

Middle Sections.—Plant Ruta Bagas, Turnips, Endive, Cauliflower, Cabbage, Celery for early crop. Give the vegetables careful attention in cultivation to destroy all weeds and keep the ground in a loose, open condition for the proper absorption of moisture from the atmosphere and the rapid development of the plants.

Southern Sections.—Sow late Tomatoes and plant Corn for a late crop. Towards the end of the month bush Beans may be planted. In the middle of the month sow Cabbage seeds for winter use. Still plant Sweet Potato Vines.

AUGUST—*Upper Sections.*—Continue planting Snap Beans for table use. If Cabbage and Celery plants have not been planted, set these out early in the month and water the Celery regularly, as this is a dry month. Lettuce for fall heading may be planted now. All kinds of Turnip seeds may be sown.

Middle Sections.—Set out fall Cabbage; sow Kale, Ruta Baga, and Turnip seeds; English Peas and Snap Beans for fall use may be sown during this month; the main crop of Celery must be set out at this time. Lettuce sown under glass for winter use will be a valuable crop.

Southern Sections.—Bush Beans, Peas, and late Cabb ge will be planted during this month; also, Kale and Brussels Sprouts. During the first of the month sow Cauliflower seeds. Sow White Strasburg Radish and Yellow Turnips, and near the end of the month the red varieties of Turnips may be sown. This is the time for sowing Celery, and some Celery plants may be set out at this time if they are watered and shaded. Set out Tomato and Shallot plants for late crops Kohl-rabi and Ruta Baga seeds may be sown.

SEPTEMBER—*Upper Sections.*—Sow Onion seed. Put out Onion sets. Sow winter Radish, Kale, Spinach, Turnips.

Middle Sections.—Sow Kale for winter use; sow Spinach in drills; plant Onion sets; sow broadcast Turnip seeds for salad, and sow Radishes for late crop.

Southern Sections.—Most of the seeds mentioned for August can also be sown during this month, in addition to Parsley, Beets,

Carrots, early varieties of Peas, Lettuce, and Corn Salad. Transplant Celery in the ditches prepared for it, and set out Cabbage and Cauliflower plants. Begin sowing Creole Onions after the middle of the month.

OCTOBER—*Upper Sections.*—Sow Kale, Mustard, Turnips for salad, Spinach, and Lettuce. Put out Onion sets.

Middle Sections.—Sow Kale and winter Spinach. Transplant Celery to the trenches prepared for it; plant Onion sets and Shallots. Plant all kinds of Radishes, Carrots, Salsify, Beets, Parsley, Endive, Kohl-rabi; Corn Salad and Turnips may be sown this month. Sow Cabbage and Cauliflower in frames.

Southern Sections.—Towards the end of the month the Marrow Fat and Black-Eyed Peas and English Windsor Beans may be planted. Sow Cabbage, Cauliflower, Brussels Sprouts, Carrots, Beets, Parsley, Parsnips, Radishes, Spinach, and Lettuce. Near the end of the month begin earthing up the Celery plants and water frequently.

NOVEMBER—*Upper Sections.*—Sow Lettuce and early varieties of Cabbage seeds in cold frames, leaving off the glass to harden the plants.

Middle Sections.—The first of the month sow Carrots and protect with litter. Sow Cabbage and Cauliflower in frames.

Southern Sections.—Sow all varieties of winter vegetables. For spring heading sow late flat Dutch and Drumhead Cabbage; late varieties of Peas will also do well this month. Prepare hot-beds for Cucumber seeds.

DECEMBER—*Upper Sections.*—Hot-beds and green-houses must be used for vegetable seeds during this month. Very little can be done in the open ground.

Middle Sections.—The same is true with this portion of the South. December is generally a severe month for tender plants, and the hot-beds and green-houses must be depended upon for all character of sowing.

Southern Sections.—Carrots, early Cabbage, Endive, Lettuce, and Radishes may be sown during this month in the far Southern sections. Early Erfurt Cauliflower may be sown, and the Marrow Fat and late varieties of Peas. Prepare the ground for planting fruit trees. Prune fruit trees.

Sixteen Most Harmful Weeds.

(YEAR BOOK DEPT. AGRI., 1897.)

Names. Common and Technical	Origin; Where Now Largely Injurious.	Time of Flowering.	Time of Seeding.	Habit; Color, Size, and Arrangement of Flowers.	Duration; Method of Propagation and Distribution.	Place of Growth and Products Injured.	Methods of Control and Eradication.
BINDWEED. Bearbind Morning Glory. *Convolvulus arvensis.*	Old World New Engl'nd to Texas.	June to September.	Aug. to November.	Running or climbing vine, 2 to 8 feet long White, 1 in., solitary.	Perennial. Seeds in hay or in impure seed; running roots carried by cultivating tools and with nursery stock.	Rich loam. Grain and hoed crops, especially gard'n crps	Frequent hoeing; thorough continued cultivation; application of coal oil or carbolic acid; thick seed'ng with smothering crops.
BURDOCK. Beggar's Button Gobo. Great Dock. *Arctium lappa*	Europe New England to Texas.	July to September.	Aug. to October.	Erect, br'nching, 3 to 5 feet. Purple, one-half in., head.	Biennial. Seeds carried by animals and hay.	Pastures, fence rows, and grain fields, Wool, grain.	Repeated mowing before the flowers appear; burning mature plants and burs picked from animals.
CHESS Cheat. *Bromus inermis.*	Europe. All grain-raising regions.	June to July.	July to Aug.	Erect, grass, 1 to 2 feet. Green, one line spikelets in panicles.	Annual. Seeds in grain and grass seed.	Grain fields. All small grain.	Cultivation with hoed crops; use of cleaner seed; use of horse weeder in winter wheat.
COCKLEBUR. Clotbur. *Xanthium Canadense.*	Northern Unit'd States. All States.	June to September.	Aug. to September.	Erect, br'nching, 1 to 3 feet. Green, $\frac{1}{4}$ in., head.	Annual, seeds; burs carried by animals in wool, and by streams.	Fence rows, roadsides, pastures & meadows. Wool and pastures.	Cultivation; burning mature plants before plowing; grubbing or mowing along fence rows before burs form; grazing by sheep.
DANDELION. *Taraxacum taraxacum*	Europe. All States.	May to October.	May to November.	Stemless, flower stalk 4 to 10 in. Yellow, 1 inch, head.	Perennial. Roots forming crown. Seeds carried by wind and in grass seeds.	Meadows, pastures & lawns.	Cultivation; repeated pulling up of weed.

DOGFENNEL, May Weed, *Anthemis cotula.*	Europe. All States.	June to Aug.	July to September.	Ascending, branching, 10 to 20 in. White, yellow center, $\frac{3}{4}$ in., head.	Annual. Seeds in grass seeds and in hay.	Roadsides, meadows & pastures.	Mowing before flowers open; cultivation.
HORSE NETTLE, Bull Nettle, Devil's Potatoes, Sand Briar *Solanum Carolinense.*	Southeastern Unit'd States. General.	June to September.	Aug. to December.	Ascending, with spreading br'ches, 10 to 30 in. Purple, 1 in., short raceme.	Perennial. Running roots distributed by cultivat'g tools; seeds in berries, carried by birds, and in hay.	Meadows, pastures, roadsides. All crops.	Cultivation alternating with thick seedings with annual leguminous crops or millet; application of carbolic acid or hot brine.
HORSE WEED, Butter Weed, Colt's Tail, Flea Bane. *Erigeron Canadense.*	Eastern U. S. In all States.	July to September.	Aug. to October.	Erect, br'nching above, 3 to 5 feet. White, $\frac{1}{4}$ in., heads in cymes.	Annual. Seeds carried by wind and in hay.	Meadows, grain fields, and waste places. All crops.	Mowing before flowers open; cultivation; burning stubble before plowing; cleaning out weeds and seeding waste places.
JOHNSON GRASS, Means Grass, Cuba Grass. *Andropogon halepense.*	Old World, North Carolina to Tex.	June to Aug.	July to September.	Erect, grass, 2 to 4 feet. Green or purple, $\frac{1}{8}$ in., panicle.	Perennial. Rootstocks carried in nursery stock, and scattered by cultivating tools; seeds in hay.	Moist or sandy land. All crops except hay.	Close grazing, induced by salting the plants; alternate cultivation and heavy cropping; plowing to expose root stocks to hot sun or frosts.
NUT GRASS, Bitter Coco, Nut Sedge. *Cyperus rotundus.*	Tropics. Virginia to Tex	July to September.	Aug. to November.	Erect, grass-like, 6 to 12 in. Green; half line spikes in umbels.	Perennial. Tubers carried in nursery stock and by tools; seeds carried in hay	All soils. Hoed crops.	Thorough cultivat'n, alternating with thick seedings with cowpeas, velvet beans, or Japan clover; confining hogs over small patches.
PIGEON GRASS, Pussy Grass, Summer Foxtail. *Chaetochloa glauca.*	Old World. In all States.	June to September.	July to October.	Erect, grass, in bunches. 10 to 40 in. high, Green, one line bearded spikes.	Annual. Seeds in grain and grass seed.	Broken land, especially grain fields and thinly seeded meadows and pastures.	Late cultivation in hoed crops; mowing or burning stubble; use of clean seed; seeding idle land.

Sixteen Most Harmful Weeds—Continued.

Names, Common and Technical.	Origin; Where Now Largely Injurious.	Time of Flowering.	Time of Seeding.	Habit; Color, Size, and Arrangement of Flowers.	Duration; Method of Propagation and Distribution.	Place of Growth and Products Injured.	Methods of Control and Eradication.
RAGWEED, Bitterweed, Hogweed, Little Ragweed. *Ambrosia artemisiaefolia.*	Eastern U. S. All States.	July to September.	Aug. to December.	Erect, br'nching, 1 to 6 ft. Staminate, yellow, $\frac{1}{4}$ in., heads in raceme, pistillate. Gr'n. $\frac{1}{4}$ in. axillary.	Annual. Seeds carried in grain, clover seed, hay and wool.	Roadsides, cultivated fields. All crops.	Late cultivation with hoed crops followed by seeding with winter annuals; burning or mowing wheat stubble and roadsides.
RIB GRASS, Black Plantain, Buck Thorn, Deer Tongue, Ripple Grass. *Plantago lanceolata.*	Europe. In all States where red clover is cultivated.	June to October.	July to November.	Stemless, flower st'lks 6 to 18 in. White, 1-6 in., spike.	Perennial. Root forming crown. Seeds in hay, clover and grass seed.	Everywhere, espec'lly in lawns and meadows. All crops.	Cultivation with hoed crops; use of clean seed.
WILD CARROT, Birdsnest, Devil's Plague. *Daucus carota.*	Old World. New Engl'nd to Georgia.	July to September.	Aug. to December.	Erect, br'nching, 2 to 4 ft. White, 1 line, umbels.	Biennials. Seeds carried by animals, wind, and in impure clover seed.	Meadows, pastures, & waste land. Hay and grain.	Cultivation; repeated mowing when in flower; grubbing; burning mature plants.
WILD ONION, Field Garlic. *Allium vineale.*	Europe. Pennsylv'nia to Alabama.	June to July.	July to Aug.	Stemless, flower stem 1 to 2 feet. White, one line, umb'ls.	Perennial. Bulbs carried in nursery stock and scattered by tools; bulblets and seeds in grain.	Everywhere. Dairy products, grain, flour.	Cultivation with hoed crops, alternating with dense-growing leguminous crops; application of carbolic acid
YELLOW DOGFENNEL. *Helenium Autumnale.*	Texas and Mexico, Ga. to Tex.	July to October.	Aug. to November.	Erect, br'nching, 1 to 3 ft. Yellow, $\frac{1}{4}$ in., head.	Annual. Seeds carried in hay.	Meadows, pastures, & grain fields. All crops.	Cultivation with hoed crops; mowing before flowers open.

Weights and Measures.

Troy Weight—

24 grains	1 pennyweight.
20 pennyweights	1 ounce.
12 ounces	1 pound.

Apothecaries' Weight—

20 grains	1 scruple.
3 scruples	1 drachm.
8 drachms	1 ounce.
12 ounces	1 pound.

Avoirdupois Weight—

27.34 grains	1 drachm.
16 drachms	1 ounce.
16 ounces	1 pound.

Long Measure—

12 inches	1 foot.
3 feet	1 yard.
$5\frac{1}{2}$ yards	1 rod, pole or perch.
40 rods	1 furlong.
8 furlongs	1 statute or land mile.
3 miles	1 league.

Square or Land Measure—

144 square inches	1 square foot.
9 square feet	1 square yard.
$30\frac{1}{4}$ square yards	1 square rod.
40 square rods	1 rood.
4 roods	1 acre.
640 acres	1 square mile.

Liquid Measure—

4 gills	1 pint—28.875 cubic inches.
2 pints	1 quart—57.75 cubic inches.
4 quarts	1 gallon—231 cubic inches.
63 gallons	1 hogshead.
2 hogsheads	1 pipe or butt.
2 pipes	1 tun.

Dry Measure—

2 pints	1 quart.
4 quarts	1 gallon.
2 gallons	1 peck.
4 pecks	1 struck bushel.

The Metric System of Weights and Measures.

Metric Units in English Equivalents:

	Inches.	Feet.	Yards.	Miles.
Centimeter	0.393685	0.032807	.....	.....
Decimeter	3.93685	0.328071	0.109357	.....
Meter	39.3685	3.280711	1.09363	.....
Decameter	393.685	32.8071	10.9357	.....
Hectometer	.....	328.071	109.357	0.0621347
Kilometer	.....	3280.71	1093.57	0.6213466
Myriameter	.....	32807.1	10935.7	6.213466

Are—154988 sq. in., 1076.4 sq. ft., 119.60 sq. yds., 0.0247 acres.
Hectare—107.64 sq. ft., 11.960 sq. yds., 2.471 acres.
Liter—33.8 fluid ounces, 1.0567 liquid quarts, 0.02838 bushels.
Gram—15.43234 grains, 0.03527 ounces avoid., 0.0022 lbs. avoid.
Kilogram—2.2 lbs. avoid.

Foot—0.3048 meters, 3.048 decimeters, 30.48 centimeters.
Mile—1609.344 meters, 1609 kilometers.
Acre—40.4685 ares, 0.4046 hectare.
Gallon—3.7854 liters.
Pound—0.4535 kilogram, 4.535 hectograms.
Ton (2,000 lbs.)—907.1 kilograms, 0.9071 tonne.
Bushel—35.237 liters.

A cubic foot is equal to—
1728 cubic inches.
0.8036 struck bushels of 2150.42 cubic inches.
3.2143 pecks.
7.4805 liquid gallons of 231 cubic inches.
6.4285 dry gallons.
29.922 liquid quarts.
25.714 dry quarts.
59.844 liquid pints.
51.428 dry pints.
0.2667 barrel of three struck bushels.
0.2375 liquid barrel of 31½ gallons.

Legal Weight of a

	Alabama.	Arkansas.	California.	Colorado.	Connecticut.	Delaware.	Florida.	Georgia.	Illinois.	Indiana	Iowa.	Kansas.	Kentucky.	Louisiana.	Maine.	Maryland.	Massachusetts.
Apples											48						
" Dried	24	24						25	24	25	24	24	24			28	
Beans, Castor	46	46						46	46	46	46	46	45			46	
" White	60	60		60	60				60	60	60	60	60		64	62	
Beets					60				60	60	60						
Blackberries											32						
Carrots					55												
Cherries											40						
Corn, Sweet									46								
Cranberries									33	33	33						
Currants											40						
Gooseberries											40						
Grapes											40						
Onions	57	57		57	50			57	57	48	57	57	57		52	57	52
" Sets																	
" Tops									28	28	28						
Parsnips					45				55								
Peaches											48						
" Dried	33	33							33	33	33	33	39				
" Pared									40	33	33					40	
Pears																	
Peas	60	46			60				60	60	60		60		60	60	
" Ground													24				
Plums, Dried																	
Potatoes, Irish	60	60		60	60			56	60	60	60	60	60		60	60	60
" Sweet	60	50						60	55	55	46	55	55			56	
Pop-Corn									70								
Quinces											48						
Raspberries											32						
Rutabagas					60												
Strawberries											32						
Turnips	55				50				55	55	55	55	60		60	56	

*Bushel in Each State.**

Michigan.	Minnesota.	Mississippi.	Missouri.	Nebraska.	Nevada.	New Hampshire.	New Jersey.	New York.	North Carolina.	Ohio.	Oregon.	Pennsylvania.	Rhode Island.	South Carolina.	Tennessee.	Texas.	Vermont.	Virginia.	West Virginia.	Wisconsin.	R. R. Weights.
...	...		24	24			25	32		32	45			26	26	28		28	25	57	56
32	28		46	46				46		46	98	24		46			16			28	24
46	46		60	60		60	60	62		60		46		60	60	60		60	60	46	46
60	60		60					60		60		60								60	60
																				50	
																				50	
40	33		33					33		33										33	
54	56		57	57			57	57		56		57	50	57	56	57	54	56		50	57
				25																	
28	28		28					28		25										28	
			33																	44	
28	28		33	33			33	32		33	28	28		33		28		33	33	28	33
28			33					28		36										28	
											45										
60	60		60	60	60	60	60	60	50	60				60	60		60	60		60	
28																					
60	60		60	60	60	60	60	60		60	60	56	60	60	60	60	60	60	60	60	60
56				50			54	55		50		55		50	50	55	55	56		54	55
																				56	
58	55		55	55				55		56		55	50			55		56	60	42	56

*Local usage sometimes varies from legal enactment. All States recognize the use of the standard United States bushel, without reference to weights of articles measured, and some States no longer legalize any other.

Every intelligent gardener should have some, if not all, of the following books on the shelves of his library to guide him in the proper cultivation of his garden:

Asparagus Culture, by Barnes and Robinson.
American Fruit Culturist, by Thomas.
Annals of Horticulture, by Bailey.
American Pomological Society, Proceedings of.
Apple Culture, Notes on, by Bailey.

Bulletins of the States' Experiment Stations. (The name of each gardener should be on the mailing lists of these stations and the bulletins should be carefully read and filed for reference.)
Bulletins of the United States Department of Agriculture. Many valuable bulletins and circulars are issued each year by this department.

Cauliflowers, by Brill.
Celery for Profit, by Grenier.
Cabbages and Cauliflower, How to Grow, by Gregory.

Draining for Profit and Health, by Waring.
Drainage, Farm, by French.
Dictionary of Gardening, by Nicholson.
Drainage, Tile, by Chamberlain.
Drainage, by Miles.

Farm, Gardening and Seed Growing, by Thurber.
First Principles of Agriculture, by Voorhees.
Fruit Garden, by Barry.
Fruits and Fruit Trees of America, by Downing.
Fertility of the Land, by Roberts.
Fruit Growing Principles, by Bailey.

Gardening for Profit, by Henderson.
Gardening and Farm Notes, Market, by Landreth.
Grape Growers' Guide, by Chorlton.
Grape Training, by Bailey.
Garden Making, by Bailey.
Greenhouse Construction, by Taft.
Grape Culturist, by Fuller.

How Crops Feed, by Johnson.
How Crops Grow, by Johnson.
Handbook of Plants, by Henderson.
Horticulturists' Rule Book, by Bailey.

Injurious Insects of Farm and Garden, by Treat.
Insects Injurious to Vegetation, by Harris.
Insects, Manual for Study of, by Comstock.
Insects Injurious to Fruits, by Saunders.
Insects and Insecticides, by Weed.

Landscape Gardening, by Elliott.

Manures, Talk on, by Harris.
Manures, A Treatise on, by Griffith.
Mushrooms, How to Grow, by Falconer.

Nursery Book, by Bailey.
Nut Culturist, by Fuller.

Olive, The, by Marvin.
Onion Culture, The New, or Onions for Profit, by Grenier.
Ornamental Gardening, by Long.
Onion Raising, by Gregory.

Pear Culture for Profit, by Quinn.
Potato Culture, Sweet, by Fitz.
Peach Culture, by Fulton.
Propagation of Plants, by Fuller.
Potato Culture, The New, by Carman.
Potato Culture, by Terry.

Success in Market Gardening, by Rawson.
Spraying of Plants, by Lodeman.
Soil, by King.

Truck Farming in the South, by Oemler.

INDEX.

A Wonderful Idea for Stock Owners.

For years observant stock owners have known that sick horses have certain ways of acting in certain diseases. If a horse has a certain disease he will stand or lie down in a certain peculiar way. If ten thousand horses have that disease, probably nine thousand, nine hundred and ninety-nine of them will act in the very same manner. They can't talk, and it is their only way of making known to us what is the matter with them. Now then, if we knew the particular attitude which horses take in the various ills to which horse-flesh is heir, we would be able to tell almost as soon as we saw a sick horse just what is the matter with him.

A few years ago an eminent veterinary surgeon went to work to verify this theory. Everywhere he went he took his kodak, and whenever he saw a sick horse he took a snap-shot at it. Photographs of people do not always tell the truth, for photographers have learned how to please their customers; but a horse dosn't care whether he makes a pretty picture or not, and the photographs taken by this surgeon establish beyond doubt the theory on which he was working. When he realized this, he went to work to arrange the entire series of pictures in a book in such a manner that a man who has a sick horse has only to turn the leaves of the book to find the trouble. This great book,

The Stock Owner's Adviser,

By C. K. RHODES, V. S.,

Is not only a comprehensive work on the treatment of stock, but it is also of the nature of an invention—a wonderful invention, which promises to revolutionize the stock world. The idea of such a book is absolutely startling. Whenever a horse-lover hears of it he opens his eyes wide in utter astonishment. "Wonderful!" he exclaims. "Must have it? Of course I must have it. That doctor has got the idea, and I want his book quick."

How it Works.

Suppose you have in your home a copy of THE STOCK OWNER'S ADVISER. One day your horse becomes ill. You stand and watch him a few moments, and then you go in the house and get your book. And then you sit down on a log and watch your horse again. You notice the various positions into which he gets. Presently you will notice that while he shifts into several positions, there is one position into which he always

drops back—a position which seems to give him a momentary rest. He lingers in this position for awhile, and then drops in several other attitudes, perhaps in rapid succession; then he comes back to this position which gives him rest. This position into which he always drops back—the position which seems to give him the most ease—is the prominent symptom. Now then, you open your book and turn the leaves in which horses are pictured in the various positions into which they get when they are ill; you find a horse occupying the same position your own horse is occupying be ore you. This picture will refer you to a description of the disease of which the prominent symptom is photographed. Then, to be sure that you are right, you turn to this description and you find all the symptoms fully described, and the prominent symptom (that is, the position into which the horse always drops back, and which gives him the most ease) is fully set forth. Now you know that your horse has the disease here described, and you have nothing to do but to read the instructions concerning the remedy, and go to work. You can cure your horse as well as a veterinary surgeon. Like the working of a problem, there is but one answer, and when you get the answer you know it. There is hardly a possibility of a mistake.

But this great work does not treat of the horse only. It is a complete stock owner's text-book. It describes and offers remedies for the

Contagious Diseases of Sheep, Cattle, Swine, and Dogs.

There is no question which a man can ask when his horse is sick, or when he has just bought a cow, or when his lambs begin to gambol on the lawn, or when his hogs refuse to fatten, or when he has just come into possession of the best doggy in the world, that this book will not answer.

To buy this book is to invest in a life insurance policy on your stock. It is the stock owner's great protection against loss by disease.

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