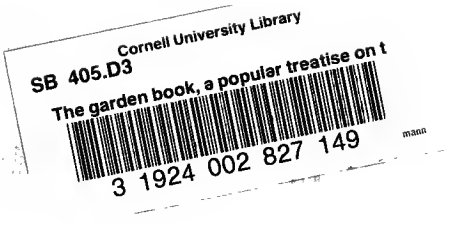
THE GARDEN BOOK

VERNON HAYES DAVIS

FARM-LIFE SERIES



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Note the trellis supporting the peas

The Garden Book

A popular treatise on the growing of vegetables under both home and market conditions. Containing concise and dependable information concerning the planting, cultivation, spraying, harvesting and marketing the common garden vegetables in such manner as to secure the largest measure of satisfaction, pleasure and profit.

By

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ILLUSTRATED

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PREFACE

The primary object of "The Garden Book" is to help and encourage the home gardener in his efforts to secure for himself and family an abundant supply of vegetables, and thereby obtain a greater economy in the food supply of the home, together with a greater measure of health and happiness for everyone concerned.

Remembering, however, that these small areas about the home are often only the beginning of an interest and success that rapidly grow into large commercial importance, this phase of the work has not been neglected. The commercial gardener will find the book helpful and suggestive in selecting his location and in planning and managing the planting, cultivation and marketing of his crops.

The importance of good seed carefully selected is discussed in its various phases. The insects and diseases of vegetables receive their share of attention. These enemies of the garden are discussed from the standpoint of their place in the natural order of things, and the reasons why these pests are more numerous today than in former years also suggests many natural methods for their control.

The Garden Book makes little claim to originality. The endeavor has been to state in as simple and direct manner as possible those methods and practices that home and commercial gardeners have found most desirable and profitable.

Should this little book prove helpful in making both home and commercial gardening more pleasant and profitable, the author will feel that his efforts have not been without some measure of success.

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CHAPTER I

Home Gardens

The high cost of living, a better understanding of the dietetic value of garden products and the possible influence of the same upon the contentment and happiness of the family are perhaps the principal factors responsible for the present interest in the vegetable garden as a valuable, almost a necessary adjunct to every home, where surroundings will possibly permit. The city dweller is interested in the home garden as a means of reducing the high cost of living or as a means of securing rest and recreation from a confining indoor life. In addition to this he may be actuated by a real interest in plants and love them for their own sake.

The hard-working mechanic, the lawyer, the doctor, the clerk, may all find relief from the worry and care of everyday labors in the home garden, with added pleasure and profit for every member of the family. True, the area available may seem pitiably small and the soil fail utterly to measure up to the "rich garden loams" described in the books. The slope may not be toward the south as demanded by the experts, nor the drainage and inherent fertility all that might be desired. But what matters it? Success will come if our efforts are prompted by a real desire for a garden. Some kinds will fail to meet expectations even under the best of care, but this will be only an interesting detail in the process of elimination. Some one of the almost endless number of varieties will be found adjusting themselves to the conditions

available and the following success will be sweeter and more enjoyable because of the necessary struggles to secure it.

And then what a difference in the quality of the products of our own garden as they come to the table, crisp with the morning's dew, as compared with the usual garden products from the grocery, wilted with days of exposure to heat and careless handling! Every mouthful gives a sort of double satisfaction. Every demand of the appetite is met, memory of youthful days is stirred, and with it all these products stand out as a sort of tribute to our intelligent direction of the wonderful forces of nature.

The garden lover begins to dream dreams and see visions of what he could accomplish if he really had a chance. The call of the soil is upon him and he answers as well as circumstances and conditions will permit. The result is a more varied and healthy diet, a greater freedom from worry and care, a marked increase in contentment and happiness, and, perhaps least important of all, a decided economy in the matter of food supply.

So much for the desires and dreams of the city man, but what of the country and village dweller? His should be the privilege of enjoying to the fullest an abundance of the fruits and vegetables that the soil affords. But how many really improve and enjoy these opportunities as they might? Taking the country over, comparatively few. The advantages longed for so ardently by the city dweller, who can gratify his desires only in a meager way, and perhaps not at all, are given little thought or attention by those who enjoy every opportunity to make the most of them. It is again the old question of

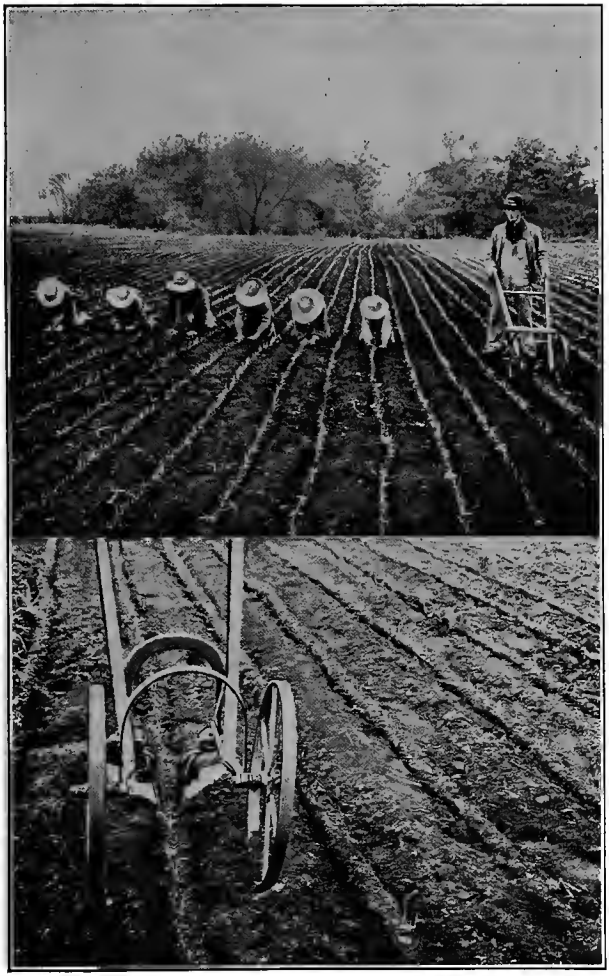
"distant pastures being greenest and the distant opportunity more attractive."

In the country the home garden is all too often looked upon as beneath the notice of a full-grown self-respecting man, and is relegated to the background in the farm plans as deserving only of the consideration of the women and children. A few roasting ears from the field, some corn beans, a few tomatoes and some cabbage, together with the ever-present potato, just about cover the list of available vegetables in all too many country homes. This meager list, supplemented by the pork barrel, salt, sugar and cheap coffee from the grocery, together with heavy and poorly baked bread, tends to destroy the health, sour the disposition, and is responsible for far more of the discontent and unhappiness of farm life than is usually attributed to it. All too often the city man's table is better supplied with fruits and vegetables the year round than is that of the country dweller.

Those interested primarily in the general lines of farming often feel that it is much better for them to grow a few more acres of corn or of wheat and buy these products of the orchard and garden, which, of course, require some effort and some expense to grow. This line of reasoning is all well and good in many cases, provided these products are bought in abundance for the use of the farmer and his family. As a matter of fact, however, in ninety-nine cases out of every hundred if the fresh fruits and vegetables are not produced upon the farm, they are never bought in anything like an adequate quantity. These products should be looked upon as what someone has called "luxurious necessities," and especially so in connection with farm life.

In no line of farming, however remotely it may be connected with fruit and vegetable growing in a commercial way, can one afford not to devote the time, energy and money necessary to produce an abundant supply of fruits and vegetables for family use. The health, happiness and contentment of the family depend upon it in a very great measure. From a mere money standpoint one cannot afford to neglect the garden. A well-kept garden makes every farm worth more than it would be otherwise, and the amount of income that may be derived from the surplus, over and above the immediate needs of the family, will usually be found to far exceed the money income from any other similar area of the farm.

Even when home gardening is successfully followed during the summer months a winter's supply of vegetables is seldom given the attention its importance deserves. Celery, beets, turnips, cabbage, carrots, parsnips, salsify, pumpkins and squash should be more extensively grown and stored for winter use by every one. All the above crops are easily grown and successfully stored, yet the potato is the only one generally utilized in this way. With a little planning and care there should be scarcely a meal from frost to frost that might not be made much less expensive, and withal more healthful and pleasant, by the presence of one or more of these products from the garden.



WEEDING AND THINNING ONIONS

Note how close the scrapers of the wheel hoe cut to the row

ABOVE—THE TRANSPLANTER AT WORK
The plants are watered as planted

BELOW—A HOTBED AND COLD FRAME YARD

CHAPTER II

Soils and Locations

The person who expects to engage in commercial gardening, depending upon it for his money income, will usually spend some time and effort in searching for a location where markets, soils and climate are well adapted to the particular crops he expects to grow. The home will be established in connection therewith. Upon the other hand, the location of the home garden is of necessity already established by the location of the house. In many cases the nature and character of the soil, drainage, fertility, etc., are not what would be selected if an opportunity for choice were presented. The location must be selected primarily with reference to its convenience and accessibility.

The first problem presenting itself is to so change and modify the soil conditions as to make the location a reasonably satisfactory one for the growth of fruits and vegetables. Inasmuch as the area involved will usually be small, this can be done at comparatively small cost. If the soil is too wet it can be drained. Tile drainage will always be preferable to surface drainage. In heavy soils the tile should be placed not less than 30 inches deep and about a rod apart. In the looser type of soils the tile should be laid 40 to 48 inches deep and two rods apart.

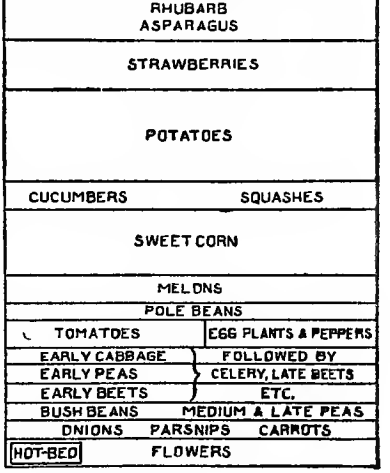
A sandy loam with a porous subsoil is generally considered to be better for a general line of garden crops. As a matter of fact, the term "garden soil"

is pretty well understood by most people, but somewhat difficult to describe. Such a soil is loose and mellow, containing plenty of sand and organic matter, together with enough clay to enable it to hold water with reasonable tenacity. It absorbs rainfall readily without serious washing and without becoming hard and baked. Surplus water is carried away quickly, making the soil warm, yet at the same time retaining sufficient moisture for plant growth. An abundance of decaying organic matter is of prime importance in garden soils. It keeps the soil loose and mellow, enables it to catch and retain moisture readily and greatly increases the amount of available plant food.

The subsoil should not be too near the surface, and neither too tight nor too porous. The deeper the soil body the better. Not less than 10 to 15 inches should be considered enough for any vegetable. Whenever less than this amount is available, measures should be taken at once to deepen it. This should be done gradually, never turning up more than one or two inches of the subsoil each year. Any type of soil growing reasonably good farm crops can be made into a good garden soil with some time and effort. Screened coal cinders or sand, together with stable or green manures will soon lighten up a heavy soil and make it a fit place for the growth of garden plants. If the soil is too light or sandy, liberal applications of stable or green manure will in turn make it more retentive of moisture, while still retaining its loose and mellow condition. Heavy soils or poorly drained soils are always cold in their character. They cannot be worked early in the springtime, and are available only for late crops.

The home garden should be located within easy reach of the house. In the country the contrary is more often the case, which always means poor care, poor crops and much unnecessary drudgery for the housewife. The garden should be placed in the most conspicuous part of the farmstead where it can be easily seen by the passer-by, and, if possible, in direct view of the most used portions of the home. Pride in the appearance of the home surroundings will stimulate good care of the garden when it is conspicuously located. Planting will be more systematically done, weeds will be kept down and the necessary fences repaired and kept in order. The garden under such conditions becomes a source of pride, and a place of beauty, furnishing a never-ending supply of fresh fruits, vegetables and possibly flowers the entire year round.

The size of the garden is also of considerable importance. In the city both the location and size are absolutely fixed by conditions beyond the control of the owner. There is no excuse, however, for the meager, cramped areas of-



A SUGGESTIVE HOME GARDEN PLAN

ten found serving the purpose of a family garden under country conditions. They are too small to be prepared and cared for cheaply and for this reason soon become neglected and overgrown with weeds. From one-half to an acre of land should be given over to the farm garden, not because this much land is necessary to produce sufficient supply for the family under the most intensive methods, but because it also provides for rotation and easy horse cultivation. It isn't necessary under farm conditions that peas and beans, lettuce and radishes and beets be grown in rows from 10 to 12 inches apart and cultivated with the wheel or hand hoe. They can be planted from 20 to 30 inches apart and the greater part of the cultivation done with the horse. Of course, the yields per acre are not so large as by the former method, but the chances are greatly increased that the crops grown by the latter method will be better cared for than by adopting a system calling for so much hand labor. The garden should be about twice as large as necessary. One-half can be devoted to growing of vegetables and the other half sown to clover during the same season. The following season the half in clover should be plowed and vegetables planted, while the half in vegetables should be sown to clover. This gives all the advantages of crop rotation and at the same time should greatly increase the production and fertility of the soil.

Southern or southeasterly slopes are usually most satisfactory because the soils warm up more readily in the springtime and quicker and easier results are secured. Sloping land gives better water drainage as well as better air drainage. The latter is important in that the danger from frost is greatly lessened on the higher lands.

The question of a cheap and abundant supply of water should be carefully considered in connection with both home and market gardens, but this is of especial importance to the commercial gardener. An abundant supply for both can often be arranged for at a small cost by a little forethought and planning.

The value of irrigation in all sections is becoming more fully appreciated every year. The quality many vegetables depends directly upon their crispness and tenderness, which in turn depend directly upon the water available. There are few seasons in many sections of the United States where irrigation could not be profitably practiced from one to ten weeks during the year. The feeling of assurance and freedom from the vagaries of the weather given by a good irrigation plant can hardly be overestimated. The principal element of chance in crop production is in this manner largely eliminated and the gardener becomes in a very true sense the master of the situation.

The various vegetable crops require different soils and different treatments. Lima beans thrive best on sandy loam soils, while the field or soup beans give better results upon heavy soils. Onions and celery thrive best upon the muck lands of the reclaimed swamps. In the home garden, where it will always be desirable to grow a large number of plants for the sake of variety and continuous supply, it is to be expected that some of the plants will do well upon the soils in question, while others will not thrive so readily. Most garden plants, however, can be grown with reasonable success upon any soil approaching the garden type where good care is given.

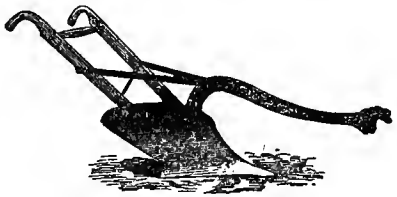
CHAPTER III

Tillage and Tillage Tools

In so far as the management of the soil has to do with the growth of crops, tillage is the most important operation in vegetable gardening. With the class of crops under consideration especial attention should be given to the thorough preparation of the soil before planting is done. No amount of subsequent cultivation can make up for the disadvantages of a poorly prepared soil. The principal thing to be remembered in the preparation of soil for vegetables is that a deep soil body is absolutely essential. Not less than 10 to 15 inches of thoroughly pulverized, well-prepared soil will give satisfactory results with any vegetable crop. If less than this amount of soil is available, steps should be taken to immediately deepen the soil. As explained heretofore, this should not be done all at once, but from one to two inches of subsoil turned up and incorporated with the surface soil each season until the required depth is secured. The principal objects of tillage operations are, first of all, to turn under and cover up organic or humus-forming materials, such as manure or green cover crops. This in turn regulates the physical condition of the soil, controls and holds the moisture supply, provides proper conditions for the action of soil bacteria, and in connection with subsequent cultivation affords splendid aeration.

In the preparation of the soil special care should be taken to have it thoroughly fine and mellow, yet

compact all the way down as deep as plowed. No clods should be left, and especially underneath the surface. The presence of clods interferes with the free development of the roots of plants, because the roots do not penetrate clods, but simply find their way between them. This leaves large areas in the soil with large quantities of plant food locked up and practically unavailable so far as the plant is concerned. In securing these soil conditions, the value of tillage implements cannot be overestimated, and the value of thorough preparation of the soil, especially for the vegetable crops, has been appreciated for hundreds of years. For the small areas in this country, and in many of the older countries, the soil is turned and pulverized entirely by hand and to great depths. It is worthy of note that in those countries where these methods of hand tillage still prevail the largest yields of vegetables are secured. The implement commonly used first in the preparation of the soil in this country is the plow. The principle of the plow used today is the same as that found in the plow used by the people of earlier civilization, yet in detail the implement has been perfected in many particulars until now some type can be found peculiarly fitted to meet almost every condition of soil and doing the work for which it was intended in almost an ideal fashion. A good plow lifts and turns the soil, at the same time thoroughly breaking, pulverizing and incorporating



BREAKING PLOW. IRON BEAM

through it the organic materials commonly returned to the soil. The walking plow is doubtless the most popular with vegetable gardeners, on account of the relatively small areas involved. In the larger areas the sulky gang plows are coming into much more common use.

The time of plowing is of especial importance, yet this depends to a considerable extent upon the type of soil and climatic conditions. Fall plowing is practiced more extensively in vegetable gardening than in general farming. Other things equal, the fall-plowed land will dry out much more quickly in the spring and can, therefore, be prepared and planted earlier. Fall plowing lessens to a considerable extent the amount of early spring work and increases the chances for all crops to be planted on time and cared for properly. Fall-plowed land catches and holds the rainfall of winter to a greater extent, permitting it to percolate down into the earth rather than to run off the surface. In other words, the soil reservoir is more thoroughly filled with moisture that may be made available for plant growth during the following season. Many insect enemies are also exposed to the destroying agencies of cold and thus reduce their damage to a considerable extent. The practice is more common in the north than in the south, largely for the reason that the frosts of the severe winters break and loosen the soil to a more marked degree. In the southern regions where plowing may be practiced almost the entire year round the danger of an over-accumulation of work at a certain particular season is not so marked, and fall plowing is not so necessary for this reason. The advantages of fall plowing are especially marked with the heavier types of soils. The advan-

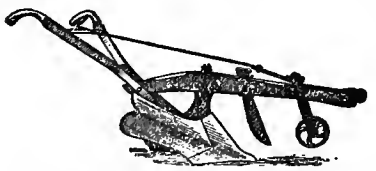
tages are not so marked with the looser and sandier types, except in so far as the garden work may be facilitated.

The condition of the soil at plowing time is of prime importance. Sandy soils may be plowed in almost any condition, but the heavier types must be plowed when containing exactly the right amount of moisture. If the plowing is done with the soil too wet, it is rubbed and puddled together and after drying out becomes hard and impervious both to moisture and to air. A single working of the heavier types when a little too wet will often ruin the physical condition of the soil for a year or more. The soil should be in such condition that the furrow slice will break and crumble readily after it leaves the moldboard. If these soils are permitted to become too dry they break in large clods, practically impossible to break down and pulverize properly without an enormous expense of time and money.

Subsoiling has often been advocated in connection with vegetable gardens, but as a matter of fact has never become a popular practice and is rarely ever followed. While deep plowing should always be the universal rule in vegetable gardens, the depth should be varied from time to time. When the land is plowed at the same depth each time, the tramping of the team, together with the pressure of the plowshare, soon tends to form a more or less impervious layer or hard pan which seriously interferes with the proper movement of moisture and the growth of plant roots. This can all be avoided by changing the depth an inch or two each time the soil is worked.

In the preparation of the soil for sowing or transplanting the next operation is commonly known as

harrowing. A great variety of harrows adapted to different types of soils and to different purposes are to be found upon the market. Two or three of these are worthy of especial mention. After plowing the disk or cutaway type of harrow will be found the most efficient in almost every case. These tools cut, turn, pulverize, stir and thoroughly mix the organic materials through the soil body, fining and compacting to the full plow depth. Their chief disadvantage from the gardener's standpoint is that they leave the soil surface somewhat ridged and irregular, but this may be easily overcome by the use of tools especially adapted to smoothing and leveling. The advantage of the disk harrow, to be especially emphasized, is the ease with which manures and green crops, decaying vegetable tops, etc., are chopped and worked into the soil in such condition that cultivating tools subsequently used work freely without catching and pulling these materials to the surface.



REVERSIBLE PLOW. WOODEN BEAM

The spring-tooth type of harrow is another tool deserving a place in every garden. It does not have the cutting effect of the disk harrow, yet it thoroughly pulverizes and turns the soil to a considerable depth and is especially adapted to rather stony or gravelly soils.

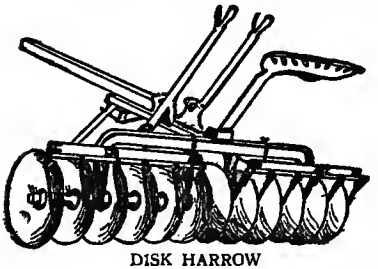
The spiked-tooth harrow is perhaps more generally used than any other tool outside of the plow, yet this almost universal use can hardly be justified by its efficiency so far as the thorough preparation of the soil is concerned.

The condition of the soil at the time of their use very largely determines the efficiency of various harrows. If the soil is too dry the clods will be imperfectly pulverized. This is especially true of the smoothing harrow type. Good-sized clods will readily pass between the teeth with little or no effect so far as crushing is concerned. The principal value of the spiked-tooth harrow is as a cultivating tool for the destruction of weeds and the maintenance of a surface mulch for the conservation of soil moisture.

The drag or planker, as it is commonly known, is deserving of a special place in connection with the preparation of the soil for vegetables. In the planting and transplanting of most vegetable seeds and plants it is quite important that the soil not only be thoroughly and deeply prepared, but that the surface be left perfectly smooth in order that small seeds may not be covered too deeply and that all kinds may be covered uniformly. In transplanting it is equally as important that the roots of the young plantlet be set at the right depth. The planker crushes and pulverizes the smaller clods and at the same time smooths and levels the surface, leaving it in the best possible condition for the seeder or transplanter to follow.

These are all tools that should be found upon any well-stocked farm. In the preparation and the planting of the home garden no special tools are called for up to this point. They are, or should be, available for this purpose without additional cost. In the small gardens of the city dweller these tools will often be out of the question. Here the first work in the preparation of the soil must be done with

the spade. This tool is so universally common that it needs no description, but, like everything else, there is a knack in its use necessary to be understood and acquired before the best results can be secured. First of all the soil should be worked deeply, from 12 to 15 inches, whenever possible. Manures or other organic materials should be turned into the soil, but not at the bottom of the spade slice. With a little experience it is possible to turn the soil in such a way as to thoroughly mix the upper and lower layers together, with the organic materials well distributed throughout the entire mass. It is sometimes advisable to spade the land over two or three times in order to get it into the best possible condition. The remainder of the work must, of course, be done by the hand tools commonly used everywhere. The great danger in the spaded garden is that the surface only will be fined, leaving the under layers of soils cloddy and poorly compacted.



DISK HARROW

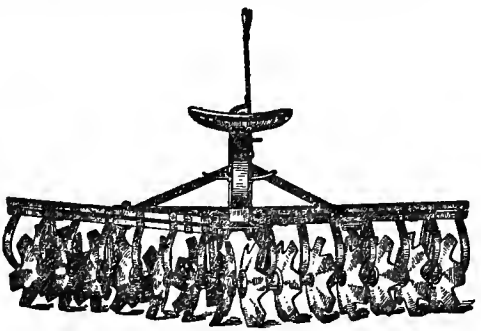
Beginners in vegetable gardening are frequently undecided as to the proper order of the tillage operations to secure the best results. No definite rules can be given because the order will often be modified by weather conditions, soils, etc. Our own practice is to follow the plow with the disk harrow, running with the furrows. The disk is then run across the furrows, after which the smoothing har-

row or drag is run across the last disk marks. Under some conditions the spring-tooth harrow will be preferred at this time. Disk again if necessary, following with the smoothing harrow and the drag until the surface is even and smooth. It should be especially emphasized that nothing is ever lost by the thorough preparation of the soil. A few hours or even days more than that required to give just ordinary preparation will more than repay the grower, by the better crops and the lessened cost of cultivation.

There are two general classes of cultivators in common use, the horse and the hand cultivators. Various types of both classes are to be found on the market, each suited to some particular condition of the soil or crop. Their value depends directly upon the tool itself, the nature of the soil, the timeliness of its use and the skill of the operator. Both the horse and the hand types of cultivators are provided with various shovel, tooth and rake attachments which serve the very important purpose of adapting the same tools to various conditions of soils and various kinds of crops at various stages of development. In working the larger garden crops such as potatoes, cabbage and sweet corn, the riding or sulky cultivators are generally employed, especially when grown in large areas, but the walking cultivators are in universal use over the smaller areas, yet large enough for the advantageous use of horse power. The small teeth and shovels are always to be preferred. They stir and break only the surface layers of the soil, do not interfere with the roots of the plants and in the best possible manner conserve and hold the moisture supply. They are not so effective in the destruction of larger weeds, but the

good gardener of today destroys the weeds before they become large and in that way obviates many difficulties on this score.

The type of horse cultivator most desirable is the common five-shovel type with its various attachments, and which can be widened or narrowed to suit various widths of rows. This type is well adapted to the cultivation of larger growing crops and in the earlier stages of development before the roots have developed to the point where they may be seriously destroyed. The spiked-tooth cultivator is better adapted to the smaller plants and during the later stages of growth.



SPADING OR CUTAWAY HARROW

By far the most valuable addition to the list of garden tools within comparatively recent years has been the hand-wheel hoe. Nothing has done more to eliminate the backache and drudgery of garden work than this implement. This tool is made in various styles and forms, some to straddle the rows, while others go between. With their various attachments they can be adjusted to cultivate rows as close as six inches apart, yet the usual distance

of planting where these tools are to be used is from 10 to 15 inches. They make possible the thorough cultivation of the soil while the plants are extremely small. They work very close to the rows and eliminate nine-tenths of the hand work. The wheel hoes or cultivators never work satisfactorily in stony or cloddy soils or in soils the surface of which are strewn with litter and rubbish. For this reason they have a double advantage. Once they have been used under proper conditions their advantages are so evident that everyone will thereafter make the greatest effort to see that the soil is so well prepared that this tool can be used to advantage. In this way the proper preparation of the soil from the plant's standpoint is assured.

While the proper preparation of the soil and its thorough cultivation with the tools already mentioned largely eliminates the necessity for hand labor, a certain amount of this kind of work will always be necessary in the vegetable garden, and more with some kinds of crops than others. Various types of hand hoes are available. The type in almost universal use is the square-headed hilling hoe, but in many respects it is poorly adapted to hand work in the garden, especially when supplementing the work of the wheel hoe. Some of the pointed types of hoes will be found more satisfactory in getting close to and between the plants.

Various types of hand weeders are also largely used, especially in the growing of beets, onions, carrots and many other closely planted crops. All of them readily destroy the weeds while small, and leave the soil around the plants in ideal condition. Most of these tools are used in thinning as well as in weeding.

It is to be remembered in cultivation generally, that level cultivation is always desirable. Any tool which leaves the land ridged and furrowed to any considerable extent exposes just that much more surface to the drying effects of sun and wind, and increasing to that extent the amount of moisture escaping directly into the air by evaporation. There are some crops under some conditions with which it may be advisable to slightly ridge or hill the rows after cultivation is completed. For the most part, however, the more level the surface of the soil is left, granting it is kept well stirred, the more satisfactory will be the result.

In conclusion, something should be said in regard to the care of the cultivating tools. Anything like a complete equipment represents the investment of considerable capital and the value and efficiency of the tools will be greatly prolonged by good care. All cultivating tools should be sheltered from sun and rain. Moisture causes rot and decay in the wooden parts and rust and corrosion in the iron parts. The sun warps and cracks the wooden parts especially, destroying proper adjustments and opening the way for more rapid decay. Both the iron and wooden parts of all tools should be painted once every year or two years at most, and the shovels, moldboards, etc., of the plows and cultivators should always be cleaned and oiled when the work of a given period is over. All parts should be kept tight if satisfactory service is to be expected. The disks of the disk and cutaway harrows and the plowshares of the plows should be kept sharp. Hoes and some of the various types of hand weeders must also be kept sharp in order to give the best results.

CHAPTER IV

Manures and Manuring

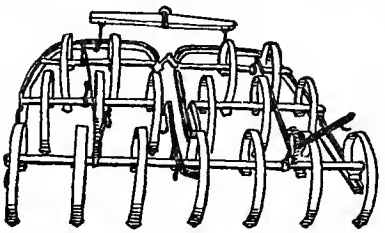
Manures in common use for vegetable gardeners may be divided into three general classes. Stable manure, green manure and commercial fertilizers.

STABLE MANURES

Of these, stable manure is universally looked upon as the most valuable fertilizing material for all kinds of garden crops. While the other sources of fertilizer are often extensively used, it is almost always only in a secondary and supplemental way. So important does the present-day successful gardener consider stable manure that it is shipped hundreds of miles at considerable expense when a local supply is not available, even though ready supplies of other fertilizers could be had near at hand at much less cost in so far as the actual plant food is concerned. While many soils are successfully gardened for a time without the application of manures, this condition exists only temporarily and in soils unusually well supplied in the beginning with organic materials. The supremacy of stable manures as a fertilizer in vegetable gardening unquestionably lies in the great value of humus or decaying organic material. The actual plant food involved can usually be bought and handled very much more cheaply in other forms, but never gives the results secured from manures. The value of the plant food contained in a ton of ordinary stable

manure could be bought in the form of commercial fertilizer for approximately $2.00, yet the results secured by the application of this amount of plant foods in the form of stable manure far exceed the results secured by the application of a similar amount in the form of mineral fertilizer.

Stable manures should, therefore, be applied primarily for their physical rather than chemical effects upon the soil. This decaying material keeps the soil loose and mellow, and open to the ingress of proper amounts of air. It catches and holds the moisture readily and makes the soil a splendid place for the growth and development of bacteria, the little organisms always active and always necessary in the proper breaking down and setting free of the plant food in a form available for plants.



SPRING-TOOTH HARROW

The relative merits of the different kinds of stable or animal manures desirable for garden purposes deserve some mention. Nine-tenths of the manure used by gardeners will be horse manure. It is drier than most other manures, looser in its texture and breaks down and gives results more quickly than most others. It decomposes rapidly under proper conditions and develops an enormous amount of heat, which, if not controlled by proper moisture conditions, results in burning or fire-fanging, and a heavy loss of ammonia or nitrogen. Excessive quantities, especially when poorly decomposed, are

likely to cause serious injury during severe drouths.

Cow manure, in some localities, is available in considerable quantities. It is a cold manure, developing little heat in its decomposition, which takes place slowly. Excessive quantities are not likely to be so injurious to the plants by causing the soil to be too dry during drouthy periods. Excellent results are secured from its use where quick and early results are not of special importance.

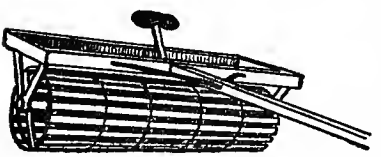
Hog manure is very similar to cow manure in its general characteristics, and is given about the same valuation by commercial gardeners. Very small quantities of this material, however, are available, except in the vicinity of stockyards or large live stock shipping centers.

Sheep manure is more like horse manure in its character, and when sufficiently moist decays very rapidly. Its fine texture renders it especially valuable to the gardener, and its high nitrogen content makes it a very important source of this element. Large quantities of this manure are now prepared and pulverized for garden purposes by the large stockyards of the country. It is considered especially desirable for greenhouse, hot bed and cold frame use.

Chicken manure is without doubt the most valuable of all animal manures for garden purposes. It contains a very high percentage of the elements of plant food, viz., nitrogen, potassium and phosphorus, and its fine texture, when the proper absorbents have been used in sufficient quantities, makes it easily applied. It is quickly available, and for this reason highly desirable for intensive gardening where close and continuous cropping is followed throughout the season. In spite of its recog-

nized value the hen manure upon most farms is largely wasted. Best results are secured by covering the dropping boards with a muck or loamy soil to a depth of one-half to one inch at frequent intervals. Frequent applications of floats or acid phosphate also prevent the escape of the ammonia and add to the value of the material for fertilizing purposes. The muck or loam retains sufficient moisture to hasten decay, and no loss of the valuable materials occur. In this way the manure may be saved in barrels or boxes during the winter months and be in excellent condition to apply to the soil when gardening time comes.

The question as to whether the manure shall be applied fresh or in a well-rotted condition is one still open for argument. In general farming, it is now considered the best plan to apply the manure to the land directly from the stables. This insures against all loss by heating or improper decomposition and materially lessens the cost of handling. Where garden crops are grown in such a way as to be cared for almost entirely by horse power, the application of manures in the fresh form is, in most cases, to be preferred, but in the intensive operations of market gardens or even of home gardens many conditions arise making it impractical to use the coarser forms of manures in their fresh condition. Their coarse texture prevents their proper distribution through the soil, while with many crops their action is not quick enough to give the best



TUBULAR ROLLER

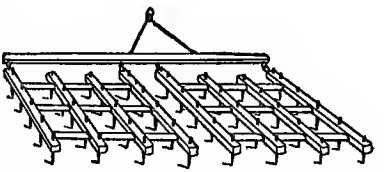
results. With other crops top growth is stimulated at the expense of the root or fruit development. It is generally conceded that for most garden crops, especially when grown in an intensive way, well-rotted manures are absolutely necessary. The chief objection to the use of well-rotted manures is that unless the decomposition has taken place under proper conditions heavy losses of the plant food have occurred both by leaching and by heating. Proper decomposition of the manure supply, in order to place it in the condition most desirable for garden purposes, requires careful attention to details and a thorough understanding of the processes going on within these materials.

The compost pile is, or should be, a common adjunct of every garden. While the word "compost" carries with it the idea of various kinds of materials incorporated therein, the usual compost piles consist largely, if not entirely, of stable manures. However, when the value of organic materials in the maintenance of soil fertility becomes better understood, nothing of this kind will be wasted, but everything will be worked into the compost pile, and find its way back to the land in the best form and as quickly as possible. The principal things to be avoided in making a compost pile is leaching and overheating. If a shed is available for this purpose, leaching may be entirely avoided and splendid results secured. This is not usually available, neither is it absolutely necessary. Good results may be secured by the following plan: The heap should be started as long and wide as thought necessary to take care of the available materials, are built up with as nearly square sides as possible to a height of four or five feet. As the materials are added

they should be spread uniformly over the entire surface and the top kept comparatively level. The above depth will be sufficient to absorb, without leaching, any rainfall likely to occur, and the uniform additions over the entire surface prevent certain spots from becoming overheated and causing loss in this manner. Sufficient applications of water should be made to keep the entire body of the heap moist, but never soggy or water-logged. This is absolutely essential to prevent heating and to hasten decay. From six to nine months will usually be required to properly decompose the heap and make it ready for satisfactory use. Decomposition may be hastened and the condition of the material greatly improved by forking the old pile over, turning the outside of the old pile toward the inside of the new one, keeping the dimensions approximately the same.

The time of applying manures depends upon their nature, the crops to be grown and the rotations to be followed. In most cases the bulk of the manure should be applied to the land before plowing. If the plowing is properly done subsequent tillage thoroughly mixes and incorporates the material through the soil. If the material is especially fine, applications may be made as a top dressing after the soil has been plowed and thoroughly worked into the soil by the harrow. The manure, however, must be in ideal condition in order to give the best results, applied in this manner. Top dressings are especially desirable when one crop follows another during the same season. The heavier manuring should be turned under as first described, in the preparation for the first crop in the early springtime. The writer has practiced the following plan with excellent results on soils somewhat deficient in

organic matter in an effort to correct this difficulty. Three or four inches of fresh horse manure is applied to the soil in the fall of the year after the last crops are off and immediately turned under as deeply as soil conditions will permit. After plowing, the land is immediately covered with three or four inches more of the stable manure and left in this condition over winter. The materials turned under are pretty thoroughly rotted by springtime, and the second application has become decidedly brittle by its exposure to the weather. As soon as the land is dry enough to work with a team the following spring, it is disked in both directions, which thoroughly chops and breaks the manure on the surface, after which it is plowed under. To be sure, the soil does not dry out quite as quickly as when the surface is comparatively free of this litter, but the land is easily prepared in good time to receive all kinds of plants that could not be placed in the soil safely before danger of frost was past. The above method is only suggestive, and the plan of application to be followed must ever remain largely dependent upon conditions local in their character, and one calling for the exercise of good judgment upon the part of the manager.



THE COMMON SPIKE-TOOTH HARROW

The use of the manure spreader will be found to greatly facilitate the labor of application as well as the thoroughness with which heavy applications may be incorporated and mixed with the soil. The manure spreader tears and shreds the manure in a

way that avoids all large masses, and, as a consequence, it plows and works into the soil much more uniformly than where spread by hand.

As to how much manure may be safely applied to give the best results depends upon a great variety of circumstances and conditions. It is to be remembered always that the common danger is in not applying enough rather than too much. From 25 to 50 tons per acre annually is considered a good application by most successful gardeners, but on certain crops many gardeners will use as much as 100 tons per acre. These amounts are almost appalling when compared with the five to ten tons applied by the ordinary farmer. However, results secured universally show that the gardener using the largest quantities of manure with good judgment is generally the most successful. Twenty-five tons per acre annually should be considered a minimum application. When commercial fertilizers are used less manure may be desirable, but it must never be forgotten that gardening may be successfully followed with manures alone, but that gardening can never be successfully followed for any length of time with fertilizers alone.

GREEN MANURES

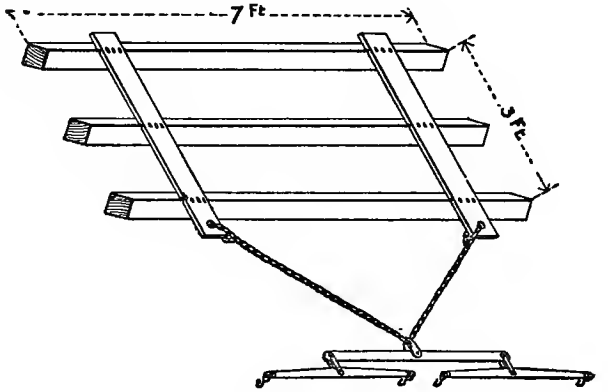
The practice of growing certain crops primarily for the purpose of turning them back into the soil as a source of organic matter is coming to be more and more common every year. While it is true that the gardener prefers the stable manures, in many locations otherwise well adapted to this business, it is practically impossible to secure manures

in sufficient quantities for the best results. The practice of growing some crop to be returned to the soil, after the main crop of the season has been harvested, is to be recommended, as it supplements the inadequate manure supply. This applies primarily to the large garden operations, and should not be necessary in connection with the farm or home gardens, where there can always be a sufficient amount of manures secured from the stables to make liberal applications over the small areas involved.

The truck garden problem is a very different one, especially if located any considerable distance from a city of some size. The more common use of the automobile for hauling purposes in the cities is bound to have its effect upon the supply of manure available for gardening purposes and to make the growing of green manures more and more necessary and important as the years go by. Any plant to be used for this purpose should be capable of making a very rapid growth, should not be injured by light frosts and should usually live over winter and start into rapid growth very early in the spring. They should be sown during the month of August or early September, the exact time varying with location and climatic conditions. Usually these crops may be started with crops already occupying the ground. They will not interfere with each other while the cover or green manure crop is small, and the main crop is removed before growth of the new crop is seriously checked. The kinds of plants adapted to this purpose vary widely, depending upon soil, nature of previous crop, etc. Rye, while a non-leguminous crop, is in many respects one of the most satisfactory for this purpose. The

seed germinates readily, makes a splendid growth during the fall of the year, and usually lives over winter without difficulty.

Winter or hairy vetch is another very desirable plant for this purpose were it not for the fact that the seed is so expensive, usually costing from $7 to $10 per hundred pounds. From 30 to 50 pounds of seed per acre should be sown in order to secure satisfactory results.



A GOOD DRAG

Various clovers are sometimes used, but generally have the disadvantage of being difficult to germinate and secure a stand when sown in the late summer, when a lack of moisture in the soil may be taken as a matter of course. Few of them make sufficient growth in the short time left after seeding to be of any particular value as a cover.

Oats is another crop lending itself to this purpose very well. The seed germinates quickly in the late summer and if severe weather holds off long enough

makes an excellent growth, which is, however, killed down by the first severe weather.

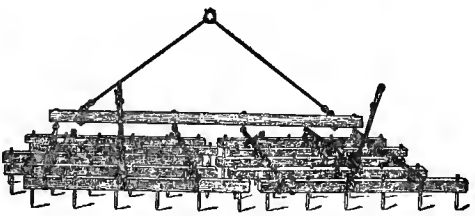
Even though the need of these crops is more particularly felt as a source of humus, their growth for cover crop purposes is of great value everywhere and under all conditions. Some rapidly growing crop coming in at the very last of the season catches and holds a large amount of the plant food rendered available by the various soil agencies during the previous summer. Some of these materials, particularly the nitrates, would doubtless be leached out of the soil and lost entirely by the following spring unless taken up and held by the cover crops. The cover crop during the winter catches and holds the moisture, preventing a rapid run-off and directing it into the soil, where it may be properly held and conserved for the coming season's crops. If the soils have become greatly impoverished, it is often necessary to make liberal applications of commercial fertilizers to the crops grown for green manure purposes in order to stimulate a sufficient growth to be of any particular value in this respect. The combination of commercial fertilizers, together with the humus derived from the cover crop turned back into the soil, very quickly and satisfactorily builds up and restores the fertility of any soil. The proper time to turn under green manure crops is again a question that must be determined by good judgment. If plowed under too early less organic material is returned to the soil and the ultimate results from the addition of humus is not so marked. If plowed under too late, the material decays slowly and in seasons of drouth may interfere with the movement of soil moisture. A happy medium between the two extremes will be

most desirable, and this must be determined largely by practical experience and observation.

In turning under heavy growths of green crops it is especially important that the furrow slice be stood on edge rather than turned flat. Rolling the soil immediately after plowing will be beneficial in that it compacts the vegetable matter and minimizes the harmful influence upon capillarity.

COMMERCIAL FERTILIZERS

The use of mineral fertilizers by commercial gardeners is rapidly increasing every year. The increase in the use of these materials is due to the



SPIKE-TOOTH OR DRAG HARROW
With levers for slanting teeth

increasing difficulty of securing stable manure in the quantities desired, together with the greater ease in handling, as well as the lower cost of actual plant food involved. In many cases the use of commercial fertilizers alone has failed to give the results expected, because the grower has been led to believe his soil problem was wholly a chemical one, when, as a matter of fact, in nine cases out of ten, it is largely a mechanical or physical one. No amount of commercial fertilizer on soil in poor physical

condition will ever give satisfactory results. Upon the other hand stable manure rarely contains a balanced ration so far as plant food is concerned. Nitrogen is usually in excess of potash and phosphorus, the latter being especially liable to be wanting in proper amounts. Splendid results are secured by supplementing the stable manure with liberal applications of potash and phosphorus. As a matter of fact, it has come to be a rather common practice,where one has control of the manure supply, to use liberal quantities of phosphate in the stables for the purpose of preventing loss of nitrogen and at the same time increasing the percentage of this element available. In the very sandy types of soils commercial fertilizers seem to give more striking results than in the heavier types, and as the gardener uses much larger quantities of manure than the general farmer uses, or could possibly use advantageously, just so we find him using much larger quantities of commercial fertilizers. From 500 to 2,000 pounds per acre of high-grade fertilizer is not an uncommon application, and perhaps from 800 to 1000 pounds would be about an average amount. Commercial fertilizers should usually be applied after the ground has been plowed and partially worked down. The later workings with the finer-toothed instruments thoroughly incorporates and distributes the materials throughout the soil. Where more than one crop is grown during the season it is more economical to apply from 300 to 500 pounds of fertilizer to each crop, rather than to apply the entire amount to the first crop. Possible waste by leaching is thus avoided and better results with all crops secured. Of the three elements commonly applied in the form of commercial fertilizers,

nitrogen is by far the most important from the gardeners' standpoint. This element is especially valuable in stimulating a rank vegetative growth, and is, therefore, especially desirable in large quantities upon those crops grown primarily for their stems and leaves, such as asparagus, rhubarb, lettuce, spinach, cabbage, kale, etc. With those plants grown for their fruits, as the tomato, cucumber, squash, melon, beans and peas, excessive amounts of available nitrogen, especially in their later stages of growth, will stimulate excessive stem and leaf growth at the expense of the fruit.

In the very early spring comparatively little nitrate is to be found available in the soil because the nitrifying bacteria do not become active until the soil temperature becomes rather high. Nitrate of soda is immediately soluble and immediately available to plant growth, therefore this element is of especial value to those crops started very early while the soil is yet cold. Nitrate of soda is usually applied at the rate of 150 to 400 pounds per acre. It is very much better, however, to apply it in small quantities at intervals of from two to three weeks rather than all at one time. The first application of nitrate should be made after the plants have become fairly well established in order that their roots may immediately begin to take it up and use it. This material should never be applied before seeding because the greater portion of such applications would be lost before the plant roots were developed sufficiently to take it up. No other single treatment will show more marked and more profitable results than the application of nitrate of soda to most crops of the types mentioned above. Indeed, so marked is the difference between plants treated and un-

treated with nitrate that in many cases the uninitiated suppose them to be of entirely different varieties.

The best method of applying nitrate of soda is by broadcasting when the plants are perfectly dry. The small grains of saltlike material bounce or glide off the leaves without sticking to them and find their way to the soil where they are quickly dissolved and almost immediately the effect upon the crop becomes manifest. Nitrate may be dissolved in water and sprinkled upon the soil at the rate of one ounce of nitrate to about one gallon of water. If the soil is very dry some plan should be employed to carry the nitrate down to the place where sufficient moisture is available to dissolve it. This may be done by opening a light furrow and sowing the nitrate in it or by sowing the nitrate broadcast and working it into the soil with any of the ordinary cultivating tools.

DRAG OR PLANKER

The importance and value of lime in connection with soil fertility are just coming to be appreciated and understood. The large quantities of organic matter and most commercial fertilizers used by the gardeners have a tendency to set up an acid condition in the soil not satisfactory to the best growth of most garden plants. Lime corrects this condition, and at the same time performs much other helpful work in the soil. Heavy clays are made more porous and open. Organic materials are decomposed more rapidly, thus releasing more quickly the plant food they contain. Various mineral ingredients of the soil are attacked and modified in

such a way as to render more of these materials available for plant growth. At the same time certain diseases destructive to some of the garden plants are very largely controlled by liberal applications of lime, notably the club root of cabbage. The rate of application must necessarily vary somewhat, depending upon the amount of acidity present or the nature of the trouble to be corrected. Usually one ton of freshly burned limestone or two tons of pulverized lime rock is considered sufficient for ordinary purposes. Such applications should be made every three to five years. The lime should be applied in the spring of the year and as a surface application after the soil has been plowed. It should never be applied with manure, as the chemical action resulting liberates the nitrogen in the form of gas, which is entirely lost from the soil. This difficulty may be largely obviated by plowing the manure under and applying the lime to the surface after the soil has been partially worked down. The form of lime to be preferred depends very largely upon the price per ton and freight rates. Usually where one is located at a considerable distance from the supply, it will be more economical to use the burned limestone. Where quarries are close at hand and the freight rate correspondingly low, it will be more economical to use the ground lime rock. The latter form is not so quick in its action, but lasts much longer.

CHAPTER V

Crop Rotation

The importance of crop rotation has long been recognized in connection with the growing of farm crops, but its value in vegetable growing has too often been overlooked or ignored. This has doubtless come about largely from the fact that the only advantage of rotation usually considered is that which has to do with the supply of plant food available in the soil. It is known that certain crops take out particular elements in larger quantities than others. The heavy applications of manures and fertilizers to vegetable crops have led the grower to feel that this factor is largely under his control, and, therefore, rotation is not as necessary for him as it is for the general farmer. One of the principal reasons for rotation, however, is the elimination of insect pests and diseases which are peculiarly destructive to the vegetable crops on account of the fact that conditions are made ideal for their development. These difficulties are largely obviated by growing different kinds of crops which allow the insects and diseases feeding upon one crop to starve out and die, while another crop is being grown.

Vegetable crops also differ greatly in the amount of humus destroyed by cultivation and likewise in the amount of humus-making materials left upon the soil when the crop is harvested. Cabbage, cucumbers, melons and squash leave rather large quantities of vegetable materials to be returned to the soil, while onions, beets, spinach and lettuce

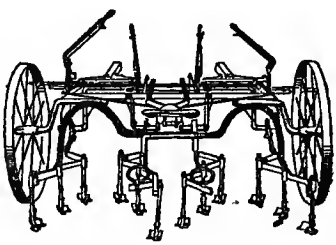
leave practically nothing. It is now thought that the roots of certain kinds of crops exude some materials more or less poisonous to themselves, which in the end seriously interfere with the growth of that particular plant. While nothing definite is known of such self-poisoning in connection with any particular vegetable, yet such a condition is doubtless possible and worth remembering in considering the value of rotation. Another reason for rotation is the varying prices secured for various crops. The keen, alert vegetable gardener who has made a careful study of market conditions should be able to foretell, in many cases, the crops that are likely to be in greatest demand. In this way a shifting of the crop scheme from time to time can often be made extremely profitable. Over small areas wide rotations are not possible, but the various kinds of vegetables may be shifted from place to place each year, thus gaining many of the advantages of rotation.

The farm garden can be so planned that the entire area devoted to vegetables can be changed each season. This is, perhaps, the ideal arrangement. In connection with commercial gardening the land is too valuable to be left idle or occupied by a farm crop for a given season, but the areas planted to each crop are much larger, and for this reason their shifting will be much more effective, not only in conserving plant food, but in avoiding many serious insect and disease troubles. Whenever possible, from three to five years should elapse between crops of the same class. That is, cucumbers, melons or squashes; or cabbage, cauliflower, Brussels sprouts, kale, radishes or turnips should ever follow each other, except at the intervals indicated above.

CHAPTER VI

Irrigation

The value of water in plant growth can hardly be overestimated. Water is not only a plant food within itself, but all the other elements of plant food must be carried into and through the plant dissolved in water. The upright position of many herbaceous plants and the proper spread of the leaves to the sunlight depend directly upon the cells of the plant being properly filled with water. When sufficient water for this purpose is lacking, the leaves, and in many cases the body of the plant, wilt and droop, as is seen particularly in case of the corn during hot, dry periods. Proper amounts of water in the soil are also necessary for the decomposition of organic as well as mineral materials therein, yet an excessive amount of moisture prevents these changes. The application of water to the soil by artificial means was long considered practical only in the arid and semi-arid regions of the country, where the rainfall during the entire season amounted to perhaps 15 inches or less. It is a well-recognized fact, however, that in almost every portion of the so-called humid regions where the annual rainfall amounts to 40 inches or more there is almost always



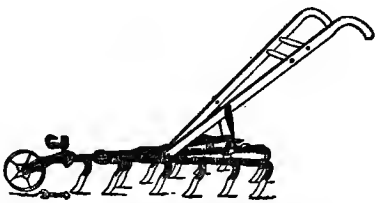
TWO-ROW HORSE CULTIVATOR

a portion of the year when the amount of moisture present is far below that required for the best growth of plants. Yields are often quartered and halved by a few days or weeks without rainfall at critical periods of growth.

Irrigation in these regions is coming to be appreciated more and more every season, and is being widely adopted by vegetable growers where the intensive methods of cropping make a drouth especially destructive and expensive. It matters not how thoroughly the soil has been prepared, how much manure and commercial fertilizer has been added, how good the seed and how thorough the care has been with reference to cultivation, spraying, etc., a few weeks of drouth, during which the plants cannot secure the necessary moisture for growth, may mean heavy losses instead of splendid profits. Some system of irrigation proves an insurance against these conditions, and year in and year out eliminates one of the principal factors of loss in commercial gardening.

King in his various experiments has emphasized the enormous quantity of water required by plants under normal growth conditions. This amounted to 385 pounds of water for each pound of dry matter produced in case of the potato and 576 pounds in the case of clover. While these relations vary from season to season they will suffice to show how important an abundant water supply is in the soil. It is to be remembered also that these amounts are only those that must pass through the plant aside from that naturally lost by direct evaporation from the soil and by surface and underground drainage. It is a great satisfaction for the gardener to realize that he is practically independent of the natural

rainfall. Maximum yields are made possible, better quality is secured, crops are matured earlier, thus giving the advantage not only of earlier products upon the markets, but likewise greater opportunities for inter and double cropping. Natural opportunities for irrigation throughout the central and eastern parts of the United States exist upon every hand. Streams, ponds and lakes in many locations furnish an abundant water supply that could be made available at slight cost. Many locations may be found where the water could be carried to the garden lands by gravity without any pumping expense. In many other cases a lift of from five to 20 feet would supply water to great areas of land admirably adapted to garden purposes. In still many other cases in the vicinity of larger cities and towns, direct connection can be had with the water works and water secured at from five to ten cents per thousand gallons.



TWELVE-TOOTH CULTIVATOR

The prospective commercial gardener, looking for a location, should take the matter of water supply under careful consideration. Irrigation is becoming more common and popular with commercial gardeners every year, and the man who does not follow this plan of crop insurance will find himself seriously handicapped in the competition with his fellow growers more favorably located.

Three possible methods of irrigation deserve

special mention. First, surface irrigation where the water is carried over the land by means of surface ditches. The supply of water may be carried to the land either by pumping or by gravity. In order to make this plan effective, the surface of the soil must be gently sloping and smooth in order that the water may be carried over all parts of the area with ease and dispatch. This plan requires large amounts of water and considerable attention to properly direct the water into the various channels in order to secure even distribution. There are many local places to be found, however, admirably adapted to this plan, and under the proper conditions none other will be found so cheap and effective.

Second, sub-irrigation has been tried in various places and a few years ago was hailed as the probable solution of this vexing question. It was claimed that the tile used for drainage, if properly laid, could in turn be used for irrigation. It was soon found, however, that in order to make the plan effective from the standpoint of irrigation, the tiles would have to be laid very much closer together and nearer the surface than would give the best results for drainage purposes. The lateral movement of the water from the tile is slow and in sandy or gravelly soils the loss of water by percolation is so great as to prohibit the use of this plan, except where almost unlimited quantities of water are available. Sub-irrigation has many advantages, but it is not to be looked upon as practical, except for very small areas and in locations where the subsoil comes within two or three feet of the surface and is comparatively tight and impervious. The area should also be comparatively level in order that

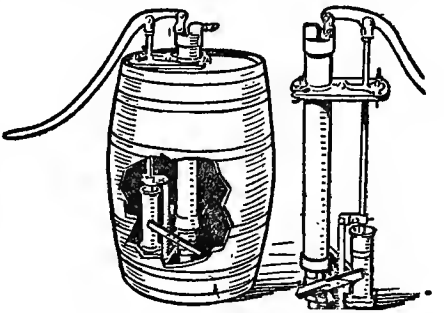
the tile may not have too much fall and give uneven distribution of the water.

Various plans of overhead irrigation have been tried from time to time, and during the last ten or fifteen years the so-called "Skinner system" has come into very common use. When properly installed this system gives almost perfect satisfaction. Very briefly the system consists of lines of perforated water pipe from 25 to 50 feet apart supported by posts from four to six feet high. The lines of pipes are so arranged that the streams of water can be directed at various angles at will. The water falls as a gentle spray over the plants without harm to them and without compacting the surface layers of the soil. The pipes are usually taken down at the end of the season and stored until the following spring. The cost of installation varies, depending principally upon location and water pressure, but usually runs from $100 to $250 per acre. Galvanized iron pipe should always be used, and if of good quality will last indefinitely. The various bulletins and pamphlets issued by the inventors and manufacturers will give all the necessary details concerning the proper installation and operation of the system.

CHAPTER VII

Insects and Diseases

So much has been said and written during the last fifteen years about various methods of combating insects and diseases that it seems hardly justifiable to take up space with what must necessarily be a very brief and incomplete treatment. Entire books have been written about the pests affecting different groups of plants. Bulletin after bulletin by the various experiment stations has been published



A BARREL SPRAY OUTFIT

upon the subject, and one can scarcely pick up a horticultural or farm paper without finding some article having to do with the injury done by some insect or disease and the remedy for the same. Too much emphasis has been placed on mere methods of treatment and too little upon the necessity for some knowledge of the insect or the disease itself. The nature and habits of the

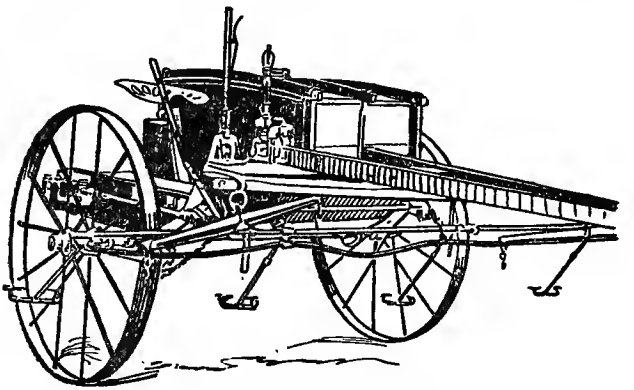
organism are usually unknown, the form in which the insect does its damage and the manner of its attack are likewise unfamiliar. The result is that much of the spraying done in the past, and even at the present, is mere guesswork. Insecticides and fungicides of various kinds are applied when it happens to be inconvenient to do other work and in many cases the wrong organism is blamed for the damage being done. Under these conditions treatment is unsatisfactory, and the grower becomes discouraged in every effort to fight the common pests. With so much available information as to the kinds of materials to use and their exact methods of application some brief discussion of the more fundamental things usually neglected will be more to the point.

The importance of the subject, however, seems to justify some further discussion of the insect and disease problem from the larger standpoint. There can be no question but what insects and diseases are much more common at the present time than they were formerly. Many of my older readers will remember when there were no potato bugs or potato blight; no San José scale, codling moth, or many of the numerous insects and disease now so frequent and so destructive in the orchards and gardens of the country. The question naturally arises as to why these later days are so filled with these pests. In the first place, by cultivation man forced many insects to change their habits. Formerly they fed upon plants of no particular commercial importance to man. They were held in check by the natural enemies of the forest and field, and development was, therefore, retarded, and their damage was comparatively insignificant, or at least unnoticed

from year to year. When man came in and cut down the forest or plowed up the prairie the natural food plants of these insects were destroyed and they were compelled to perish or feed upon the plants to which these areas were then devoted. Many of these inhabitants of forest and fields perished when their host plants were destroyed, but many others, more hardy in their character, succeeded in adapting themselves to the new conditions and have become serious pests of the cultivated crops. The destruction of the forest also destroyed the natural enemies of the pests now troubling us as well as their food supply. In the interchange of commerce between different countries new insects and diseases are being constantly exchanged, some of which find the new conditions even better adapted to their development than the old. In many cases their natural enemies have been left behind and they enjoy a period of unrestrained development under their new environment and become exceedingly annoying and destructive.

Another factor deserving of special emphasis in this connection is that cultivation always presents large areas of food plants to these organisms and nothing so stimulates their development as an abundant food supply. In the days when gardens were far apart and comparatively small there was little opportunity for the common garden pests of the day to spread from garden to garden and from section to section. But at the present time when even the home gardens are much closer together, and in the vicinity of the larger cities where the commercial gardens extend almost unbroken over hundreds and even thousands of acres, it is a comparatively easy thing for these organisms, stim-

ulated into unnatural activity by food supply, to spread from garden to garden and from field to field. Likewise, when we remember the large amount of commerce in these products between widely separated regions of the country, it is easy to understand how one pest may find its way with little difficulty from one section to another many hundred miles away. Our present-day insect and disease



FOUR-ROW POTATO SPRAYER

problem is one, therefore, that comes as a natural result of the disturbed equilibrium in nature caused by cultivation and the giving over of large areas to the growth of some particular crop. A process of readjustment, however, is constantly going on. A new pest enjoys its widest liberty and causes its greatest destruction while it is comparatively new in any locality. After a while natural enemies develop which thrive and feed upon it, or if too destructive the cultivator ceases to grow the host plant and as a result a material check inevitably

comes sooner or later. Only thirty or forty years ago the potato beetle was so destructive throughout the middle west that many people felt it would no longer be possible to grow the potato successfully. Yet natural enemies have developed which for a number of years have held this insect in check to such an extent that it has become unnecessary in many cases to give even the ordinary treatments for their direct destruction. In this connection it should be emphasized that the natural enemies of the potato beetle have done more to bring about its present comparatively harmless condition than all the poisons that have ever been used for its direct destruction combined. Garden crops in many respects are especially susceptible to insect and disease attacks. A system of close and intensive cropping is followed and the soil is occupied by similar crops for a greater length of time each season than is common with most other crops. The high value of the land usually devoted to truck and market gardening and the more or less fixed character of the location devoted to the home garden tends to discourage the proper rotation of the crops usually necessary to hold these pests under control. Time after time the gardener will continue to grow similar crops upon the same or closely adjacent areas until it becomes practically impossible to secure anything like profitable yields on account of the ravages of insects and diseases. From the very nature of things new insects and diseases are bound to appear from time to time, some of which will prove destructive for a period and then gradually slip into the memories of the past, only the remnants of the invaders remaining as a reminder of the hordes that have passed.

Direct methods of control are of extreme importance, but are after all only minor factors in the problem as it presents itself in the larger way. There are seven principal methods in common use in the direct control and destruction of insect pests. With so many effective methods available it becomes especially important that the grower be more or less familiar with the nature and habits of the insect, the time of its appearance, and the nature of its damage, in order that the best method of attack may be selected and intelligently used.

One method sometimes used is by **inclosing the plants.** In other words, the insects are fenced out. Wire fences have often proved more effective in stopping an invading army than sword and musket. A few insects of the garden can be controlled in this manner more cheaply and more effectively than by any other method. Many melon and cucumber growers follow the plan of covering the hills with a small wooden frame 12 to 15 inches square and three or four inches deep, covered on one side with cheesecloth. This frame is placed over the hill after the seed is planted. The earth is firmed around the edges in such a way as to effectually fence out the cucumber beetle, one of the most common and most destructive insects attacking this group of plants.

Some insects may be more effectively **repelled** than directly destroyed. Slaked lime is sometimes employed in combating the striped cucumber beetle. It does not kill directly, but makes the plants so treated an uncomfortable place for the insect. The common squash vine borer may sometimes be successfully repelled by the use of corn cobs or other similar materials soaked in creosote

and placed upon the hills. Tobacco in various forms frequently acts as a repellent or deterrent to many insects. Bordeaux mixture is one of the most effective remedies for the flea beetle attacking the leaves of the potato, but repels rather than kills.

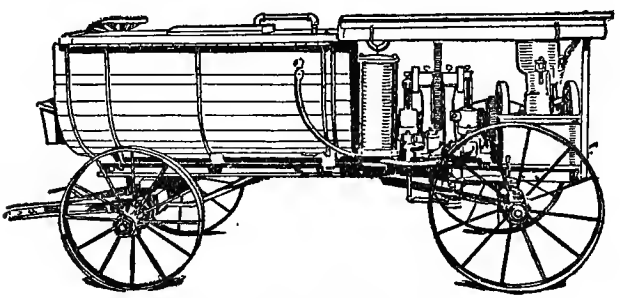
Hand picking is a method of control with which everyone is more or less familiar, although not now so commonly used as formerly. There will be very few of my readers born and raised in the country who have not gathered potato bugs in a bucket or pan, directly destroying them with kerosene, hot water, or by crushing. The gardener of today generally prefers to hand pick the tomato worm, because it usually does not appear in large numbers and is large enough to be easily found. It makes its appearance about the time the tomatoes are ripening, when the use of spray materials would discolor the fruit, or possibly cause danger of poisoning.

Trapping is often resorted to with certain pests. Cutworms will frequently collect under shingles or bunches of freshly cut grass, where they can be readily found and destroyed. Trap plants or crops may be grown in a very successful manner. For illustration, some gardeners have successfully eluded the striped cucumber beetle by planting a second hill in three or four days after the first and still a third a few days after the second. The well-known habit of this insect to hunt up the youngest and most tender plants is taken advantage of in this manner. One or two treatments of the first hill will keep the insects away until the second hill comes up, when they are allowed to feed upon this one undisturbed. By the time this hill has been consumed the last hill will be up and the insects will begin to feed upon the younger plants,

by which time the first hill will be too old for serious injury. As the breeding places and habits of the insects are better understood more opportunities will arise for the successful use of these trap crops. The above methods are not to be considered of general importance in the larger warfare against insects, but only serve to emphasize the importance of some knowledge of the pest to be combated before it can be intelligently attacked.

The use of poisons and caustics comprises the most important method of direct destruction. This covers what is commonly known as spraying. Insect pests are generally classified into two great groups, viz., *sucking* and *biting*. Sucking insects may attack almost any part of the plant, either stem, root or leaf, and do their damage by drawing or sucking the sap or plant juices from the plant. The parts attacked first shrivel, then dry up, and eventually die. The biting insects likewise may attack all parts of the plant, but their injury is more striking and more apparent because the various parts attacked rapidly disappear as they are consumed.

The first group of insects calls for some kind of



POWER SPRAYING OUTFIT

remedies sufficiently caustic or penetrating in their character to actually penetrate the body of the insect until it reaches the vital organs and destroys life in this manner. These materials must actually be brought in contact with the insect to be destroyed. Poisons would be of no value because the insect's mouth parts are down deep in the tissues of the plants entirely protected from materials of this kind. Among the common remedies for this class of insects might be mentioned kerosene emulsion, tobacco in various forms, soap solutions and the homemade and commercial lime and sulphur.

Kerosene emulsion is a remedy easily prepared at home by boiling one-half pound of any common soap in one gallon of soft water until dissolved, and while still hot adding two gallons of kerosene or coal oil (after removing from the fire). This mixture is stirred vigorously for 10 or 15 minutes, after which the material takes on a milky appearance and the oil remains in permanent suspension in the water. When kerosene emulsion is used on plants that are dormant, one gallon of the above stock solution should be used to from 8 to 12 gallons of water. When used on plants during the growing period it should be used at the rate of one gallon to 15 to 20 gallons of water.

Tobacco is a specific remedy for all forms of plant lice, both indoors and out. In the greenhouse and hotbed, where smoke can be confined, it is usually used in this form. Small quantities of leaves, stems or dust are burned at frequent intervals throughout the inclosure and the smoke confined. It is important that the fires are not allowed to become too large and hot, and better results will be secured if the stems and leaves are moistened

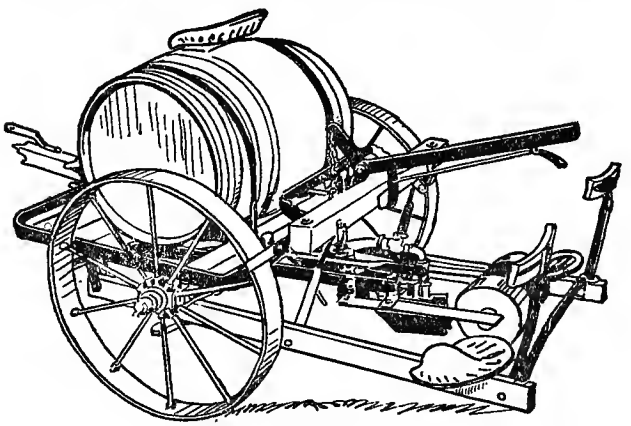
somewhat. The dust form is more frequently used out of doors, the material being dusted directly upon the plants and the insects found thereon. Various tobacco solutions are upon the market and are used in the form of spray, especially when large plants must be treated. Directions for dilution are to be found on the packages of every brand and should be carefully followed.

Under some conditions soap solutions are to be preferred over all others for certain kinds of sucking insects. If used upon dormant plants the soap is used at the rate of from one to two pounds to a gallon of water. If used on growing plants the soap is used at the rate of one pound to three to five gallons of water. Any soap will answer the purpose, but the various fish oil soaps are more commonly used, hence the common name whale oil soap solution.

Lime and sulphur as an insecticide for sucking insects is widely used in two forms. First, what might be called the *homemade*, where the lime and sulphur are cooked or boiled together under home conditions making the dark brown liquid commonly known as lime and sulphur. The common formula for preparation under these conditions is 15 pounds sulphur and 20 pounds lime boiled for one hour in a convenient quantity of water and diluted to 50 gallons. This is now ready to apply to dormant plants, but is entirely too strong for growing plants. On account of the variable composition of homemade lime and sulphur no dependable rate of dilution can be given for use on the growing plants. In order to use it safely under these conditions, the hydrometer test must be employed for each lot as it is applied. A specific

gravity of 1.0075 to 1.00025 will in most cases be found safe and satisfactory. On account of the difficulty in making the home mixture and its variable composition most people prefer to buy this material in the commercial form. Each commercial brand is usually uniform in its density and can be easily and conveniently prepared for use. The common strength for dormant use is one gallon to eight or 10 gallons of water. As a summer spray, it is diluted all the way from one gallon to 30 gallons of water, to one gallon to 80 gallons of water, depending upon the plants to be treated.

Biting insects are attacked by spreading some actual stomach poison over the parts of the plants being attacked. The poison is in this manner taken into the system of the insect with its food supply and quickly causes death. Paris green and arsenate of lead are the principal poisons used for this purpose, the latter being by far the more com-



CABBAGE AND TOMATO TRANSPLANTER

mon. Arsenate of lead is usually used at the rate of from two to five pounds to 50 gallons of water, sprayed upon the plants when the insects are present. Paris green, if pure, should be used at the rate of from six to eight ounces to 50 gallons of water. In cases where these strengths show any tendency toward burning the foliage the difficulty may be largely overcome by adding from two to three pounds of quicklime to 50 gallons of the mixture. A number of exceptions will be found in the classifications of the insects and remedies to be used for the same. Not all biting and eating insects can be readily destroyed by poisons. The peach tree borer, for illustration, eats its way underneath the bark, where it feeds upon the softer tissues of the stems thoroughly protected from any materials of this class.

Many pests are extremely difficult to control by any of the above methods, and their damage can be prevented only by the indirect method of **crop rotation.** In areas devoted entirely to the growing of onions for a number of years, onion insects will come in to such an extent as to seriously jeopardize the crop in spite of all direct treatments that may be employed. The only sensible and rational treatment is to stop growing onions for a while until these pests are starved out. The same principle applies in the control of all insects and offers one of the most important arguments in favor of crop rotation, as cited before in Chapter V.

The value of **natural enemies** and their possible introduction and encouragement is becoming of more importance in the warfare of insects every year. The dreaded gypsy moth and brown tail moth of the East have very effectually withstood all

direct methods of destruction aimed against them, and are rapidly spreading to new territory all the time. The only hope of their ultimate control seems to be the introduction of natural enemies from European countries where the insects have long existed, and where certain natural enemies largely hold them in check. Many efforts are being made to introduce and develop some of these enemies in this country throughout infested districts. It is altogether probable that some organism already present in this country may yet adopt these pests as their host and eventually help to control and check their damage. Diseases of plants are more insidious in their attacks than insects. Oftentimes the presence of the trouble is not suspected until long after infection has occurred and the plant begins to die from the effects of the same. Here, even to a greater extent than with insects, is it necessary for the intelligent grower to have some knowledge of the character of the more common diseases likely to attack his plants and the manner in which they manifest their presence before intelligent treatment can be given.

For purposes of treatment the common diseases may be divided into the following very general classes: First, **local diseases** consisting of those which are generally confined to local sections of the host and which do not spread rapidly through the tissues of the plant. Diseases of this class may be effectively controlled by cutting away the infected parts.

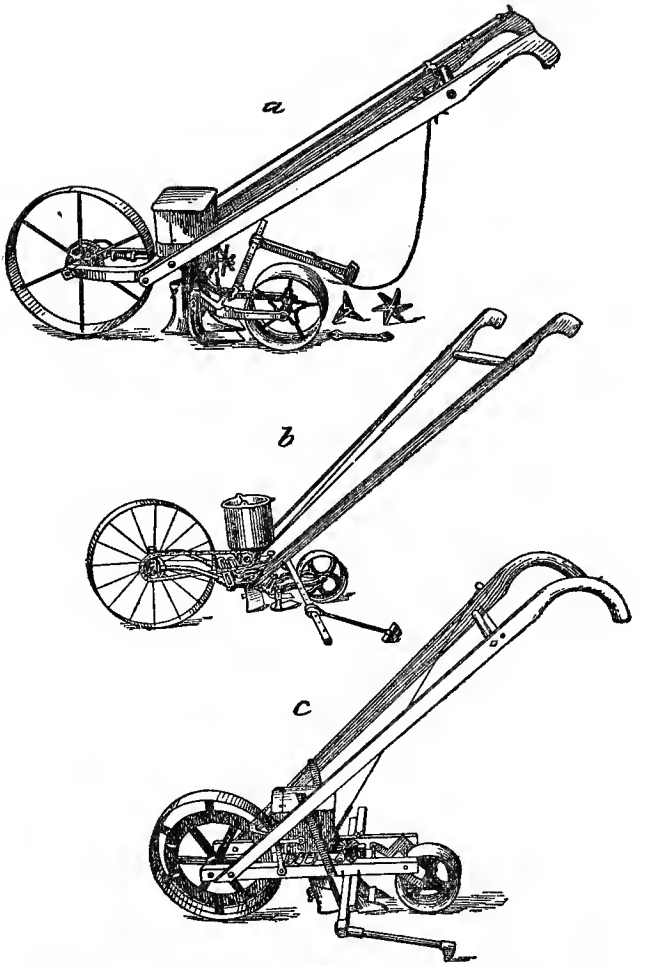
Second, the **surface or superficial diseases,** such as the mildews and molds. Direct applications of bordeaux mixture or various sulphur compounds effectively destroy diseases of this class. **Internal diseases,** such as the various rots, rusts and smuts,

are much more difficult to control, because once the disease organism is within the tissues of the host plant nothing is seen until the fruiting stage of the disease appears on the surface. Treatment must consist in killing the spores of the organism before they germinate and enter the plant. Afterward any treatment that would reach the disease-causing organism would likewise destroy the tissues of the host plant. It will be seen at once that spraying, for diseases especially, must be preventive rather than curative in its nature. No amount of treatment can ever cure a rotten cabbage or tomato. Proper treatment at the right time may prevent the trouble entirely.

The three groups of diseases mentioned above belong to the larger group of low plant life known as fungi. These are simply microscopic plants which grow and draw their nourishment from other plants rather than directly from the soil and air.

Still a fourth group of disease organisms deserves mention, namely, **bacterial diseases.** While the number of enemies found in this group is not so large as in the fungous group, they are far more difficult to control, and include many of the most destructive and persistent diseases troubling the gardener. The dreaded "damping-off" disease of the seed and cutting beds, the wilt of the lettuce and cabbage fields, as well as a number of other serious pests, belong to this group. Spraying does not seem to be effective in their control. They are bacterial in their character and spread rapidly through the tissues, becoming particularly destructive when climatic conditions become favorable for their development.

Many of the bacterial diseases, together with some



SOME EXCELLENT SEEDERS INDISPENSABLE TO THE GARDENER

of the fungous diseases, are carried from one season to another in the soil, and in a certain sense have come to be considered as soil diseases. This name is applied to them primarily because the infection to plants invariably comes through the soil, and the trouble is carried over from season to season within the soil rather than within the plant tissue. The wilts of cotton, tobacco, melon, flax, the club root of the cabbage, smut of the onion, potato scab and rosette and numerous others belong to this group. Their particular destructiveness is due to the fact that they not only kill or injure the crop, but prohibit the successful culture of similar crops in the following years. It is not known how long these organisms can remain in the soil, but it is certain that they easily live from season to season and become more and more serious as susceptible crops are repeated upon the same land. Many cases are known where rests of six and eight years have not materially lessened the trouble. Over large areas direct treatment is practically impossible. The application of chemicals or of heat under these conditions is out of the question and even if it were not, the success of the treatment would be doubtful. A long system of rotation is the only practical method of eliminating these organisms from the soil and making it possible again to grow the susceptible plants. In view of these facts it is especially important that emphasis be laid upon the protection of healthy soils from infection and to understand the ordinary methods of soil sanitation by means of which this can be done. Under greenhouse, hotbed and cold frame conditions where the areas involved are relatively small and the facilities for treatment are ready at hand, the soil may be effectively disinfected and

crops grown successfully from season to season. Few first-class gardeners fail to treat the soils of their seed beds at least once each year. No successful greenhouse manager attempts to grow crops continuously without thorough disinfection of the soil to a considerable depth at least once each season.

Three common methods of soil disinfection are in use. Perhaps the most widely and most successfully used plan is by steam. Frames of perforated iron pipes of convenient size for handling are attached to the steam pipes by means of steam hose, which allow of considerable freedom of movement. They are usually about one-half as wide as the beds to be treated, but this is not an important detail. The frame is placed on one side of the bed and the soil on the other side is shoveled over it to the depth of four or five inches and covered with burlap of some sort. Live steam is then turned into the pipes and left for several hours. The process is continued down the bed, then the frame is placed in the bottom of the side from which the soil had been removed and again covered and treated. This treatment, if carefully done, destroys all the germs of diseases present in the soil and at the same time seems to have a considerable influence in increasing the productiveness of the soil.

Formalin has been successfully used and has the advantage of requiring considerably less work than the steam method. The beds are thoroughly prepared for planting with the exception of the addition of the commercial fertilizers and then thoroughly drenched with a formalin solution of one gallon of commercial formalin to 150 to 200 gallons of water. About one gallon of this diluted solution

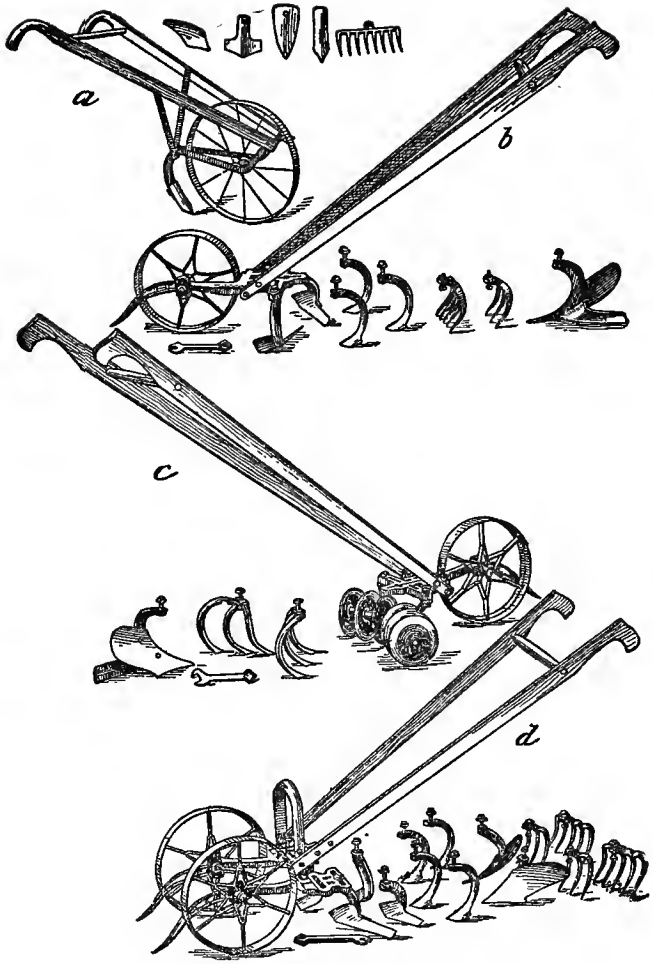
should be allowed for each square foot of surface treated. This should be enough to saturate the soil at least one foot in depth. The soil treated should be covered with burlap to retain the fumes for a day or two and then thoroughly aired for at least a week before planting. The latter precaution offers a serious objection to the use of formalin under greenhouse conditions inasmuch as it means a loss of a week's time, in many cases during the most profitable part of the season. Over small areas, especially under outdoor home conditions, the soil may be effectively disinfected by surface firing, which will greatly lessen the dangers from these troubles in the seed and plant beds. The common practice of burning brush heaps in the preparation of the soil for cabbage, tomato and tobacco plants is doubtless based upon the greater freedom from some of these common soil diseases.

Successful treatment of the common insects and diseases of the garden is not possible without the necessary spraying machinery of sufficient capacity to do effective work. Many people make the mistake of attempting to spray with outfits entirely too small. As a consequence, the work is very poorly done and usually too late for the best results. The operator becomes discouraged and gives up in disgust. With many of the low-growing plants of the garden, when the areas involved are not too large, the better type of knapsack sprayers gives splendid results. This type of sprayer, however, should be looked upon as a sort of emergency outfit to catch the smaller areas and the scattered infected plants. Where any considerable area is involved the smallest outfit that can be expected to give effective results is the barrel outfit. Indeed, it may be taken as the unit

outfit so far as spraying is concerned. As a matter of fact, practically all of our spraying formulas have been prepared in terms of 50 gallons (one barrel), and all of the spray tanks of the power outfits are usually made in multiples of this number.

A good barrel outfit may be placed on end or on the side at the will of the operator. The cylinder should be at the bottom of the barrel and the air chamber on the inside of the same. A mechanical agitator should be attached to the handle of the pump in such a way that it will automatically stir the liquid with each stroke of the same. Two lines of hose are usually carried, each of which should be not less than 25 feet in length, except under special conditions. In spraying melons, cucumbers and similar plants, after the vines have well covered the ground, a line of hose 50 or even 100 feet in length may be advantageously used by employing one or two persons to carry the hose above the plants. Each hose should be fitted with a bamboo extension rod from six to eight feet in length. Nozzles of two or three different types should be on hand in order to meet the varying requirements for a coarse or fine spray. Any of the disk type of nozzles now commonly manufactured will give excellent results. Such an outfit will usually cost from $25 to $30. A cheaper outfit is much more expensive in the end. If kept clean and well packed the above outfit should last for years and be very effective. Over large areas of potatoes, the power sprayer will be very much more effective and economical. This outfit is mounted on wheels, geared in such a way as to develop its own power by traction and usually spraying four rows at a time. In the economic treatment of large fields of pota-

toes, beans, cabbage, celery, etc., a sprayer of this type is indispensable. Some sections of the garden are of such a nature as to be much more effectively treated by dusting than by liquid sprays. One of the best methods of destroying the cabbage worm is by dusting with pyrethrum or hellebore. Dust guns can be secured for this purpose from any of the large manufacturers, and in a small way can often be used very advantageously.



TYPES OF WHEEL HOES WITH ATTACHMENTS

The gardener's best tool

CHAPTER VIII

Succession and Double Cropping

Succession cropping, as it is commonly understood in garden practice, consists simply in following one crop closely after another, in this manner securing continuous cropping throughout the entire growing season.

Double cropping consists in starting more than one crop on the land at the same time, while in succession cropping one crop is usually removed before another is started. In common practice, however, succession and double cropping overlap, and it is difficult to draw a fast line between them. By the practice of these methods no loss of space occurs, the soil is continuously occupied, there is greater economy in the tillage operations, and much larger total yields and profits per acre are made possible. Upon the other hand, these methods make heavy drains upon the available plant food and moisture content of the soil, both of which must be supplied in unusually large quantities in order to make the plans successful. While there is great saving in the ordinary tillage operations, much additional hand labor is called for, especially by double cropping. It is to be remembered also that while double cropping greatly increases the total yields per acre in a given season, it is hardly to be expected that the yield per acre of any one of the crops will be as large as if it had been grown entirely by itself. As a matter of fact, the commercial gardener's success is largely measured by

his ability to plan and carry out those systems of succession and double cropping best adapted to his soils, climate and markets. The amount of pleasure, satisfaction and profit derived from the home garden likewise may be measured by the greater variety as well as the greater quantity of materials grown from the limited areas available by a similar system.

Combinations without end might be mentioned, which are to be found in common use all over the country. In selecting the crops for such a system the matter of personal taste will largely guide in the case of the home gardens, while in the commercial gardens market requirements will receive first consideration. A few illustrations may serve to emphasize the points in question. As succession crops, early cabbage may be followed by cucumbers for pickles, late beets or string beans, all of which may usually be removed in time to be followed by a cover crop of some sort, such as rye or vetch. Peas may be followed by late cabbage and a cover crop, lettuce and radishes by almost any of the crops doing best during the hotter portions of the summer, such as cabbage, cucumber, cauliflower, which in many cases will be removed in time to be followed by a crop of turnips, winter radishes, endive or fall lettuce.

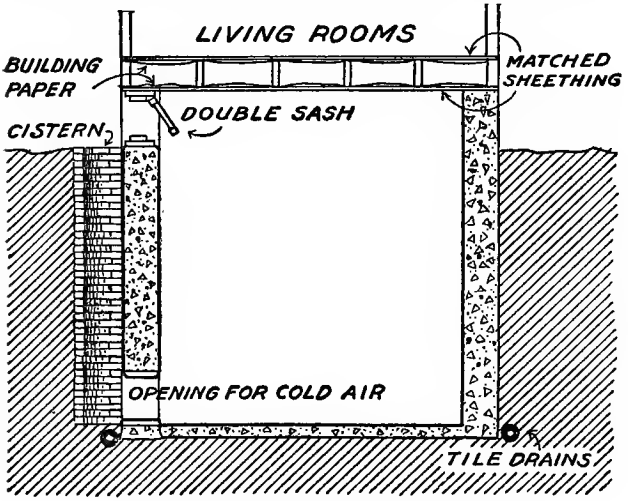
A common double-cropping combination is cabbage, lettuce and radishes, all started at the same time. The radishes will come off first, lettuce will require five or six weeks, after which the ground is totally occupied by the early cabbage. In cutting the cabbage crop, every second or third plant may be removed as early as development will permit and tomatoes started in their places. If preferred, beans,

beets or celery may follow, which in turn may be followed by a cover crop. Radishes may be sown with the early potato crop and are off the ground before the potatoes interfere. After the last cultivation of the early potatoes it is a common practice to plant sweet corn between the rows and have it well on its way to maturity before the potatoes are taken from the soil. These combinations will be sufficient to illustrate some of the possibilities along the above lines and hundreds of combinations may be worked out for each locality.

CHAPTER IX

Storing Vegetables

For various reasons it is often desirable to store vegetables in order that they may be held and sold or used out of their normal season. In connection with the home garden this is absolutely necessary in order to insure a constant supply throughout the entire year. In case of the commercial gardener, better prices for given crops can often be secured if they are held and stored for a period. Many markets require a constant supply of certain vegetables, such as potatoes, onions and cabbage throughout the entire year. This condition can be



A PROPERLY CONSTRUCTED CELLAR STORAGE

satisfactorily met only by the use of some plan of storage. On the other hand, storage, particularly from a commercial standpoint, has many disadvantages, and for this reason many gardeners prefer to sell outright when the crop is ready for harvesting. Storage involves much extra handling, which rapidly increases the cost of production and marketing, and correspondingly high prices must be secured in order to offset this expense. Much shortage, both in weight and volume, will always occur, more with some kinds of crops than others. The quality of most stored vegetables likewise depreciates more or less rapidly, although in some cases this is not sufficient to be of serious consequence. Risk of loss is always present, and is, perhaps, one of the most important factors to be kept in mind in determining the probable advantages or disadvantages of storing.

A storage for vegetables requires proper amounts of moisture, the right temperatures and thorough aeration. Some vegetables, such as the sweet potato and the onion, require cool, but extremely dry conditions for the best results, while celery requires a comparatively moist atmosphere with low temperatures. Potatoes require medium degrees of moisture and temperature. Greater variations in moisture are necessary than in temperature. From 34 to 40 degrees will usually be found the best temperature at which to keep most vegetables. Special attention should be given to proper aeration of the storages. Certain plant processes are continuously going on, even in storage, resulting in the setting free of carbonic acid gas, which, if confined closely about the plants, quickly encourages rot and decay. Vegetables to be stored for any length of time should be harvested with this point in mind. In

some cases they should not be allowed to become quite so mature as when they are to be used at once, while other plants should be perfectly matured before harvesting for storage. The process of maturing or ripening goes on gradually in storage, and the time during which they can be held without serious loss of quality will be greatly lengthened by attention to this point.

Avoid all injuries to vegetables to be stored. Whenever the tissues are broken or bruised, decay is almost sure to start, especially if moisture and temperature conditions are not quite ideal. This is true of such vegetables as cabbage and sweet potatoes. In many cases the entire quantity stored will be almost completely destroyed in a very short time by the rots carried into the storage from the fields and largely spread by the cuts and bruises of careless handling.

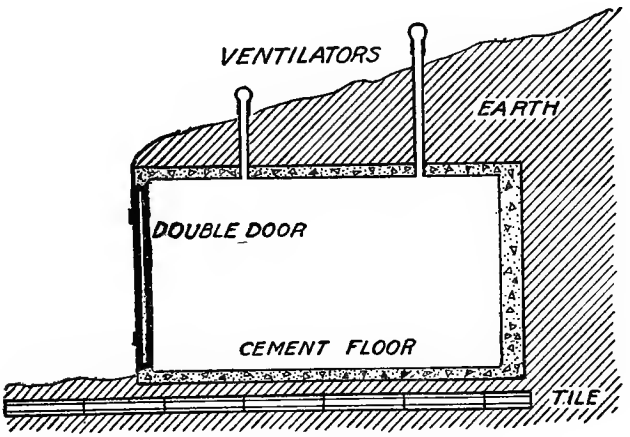
Storage rooms and houses adapted to the needs of the home gardener and the small commercial gardener are of especial interest. The storage problems of the large truck gardener are comparatively easily solved. His business is sufficiently large to justify the building of houses along the most approved lines, but for the person who grows vegetables for home use or to supply his local market in a limited way, these expensive houses are out of the question.

The common place of storing, when storing is done at all, in both city and country, is the house cellar. As it is ordinarily constructed, it would be hard to conceive of a poorer place for this purpose, and with the much more general use of furnaces in the country as well as in the city, its value has been still further decreased. The air of the ordinary cellar

is entirely too dry and too hot. Poor ventilation is usually afforded and the stench of decaying vegetables readily finds its way to the rooms above, rendering living conditions more or less unpleasant, and, in many cases, decidedly insanitary. Yet with some little thought in the construction of the house cellar these objections can be largely obviated, and the place made a very satisfactory storage for the family supply of fruits and vegetables.

Excellent insulation can usually be secured at little cost, and it is only necessary to remember that cold air settles while warm air rises, to arrange for and secure splendid ventilation in such a way as to maintain relatively low temperatures. The problem of ordinary storage, except for a very few days of winter, is not a problem of keeping warm, but of keeping cool. In laying the floor above the cellar, matched lumber should be first laid over the joist and then a heavy layer of waterproof building paper over which the flooring should be placed. The same order should follow on the ceiling of the cellar under the joist. This leaves a dead air space, which cuts off practically all the heat from the upper part of the house and prevents any odors from reaching the living rooms above. The entrance to the cellar should preferably be from the outside of the house. Although something is lost in the matter of convenience by this arrangement, the conditions for storage will usually be greatly improved, much less dirt will be carried into the house and the sanitary conditions made better. In any case, the entrance door should be double and should be made to fit perfectly tight, somewhat on the order of the ordinary refrigerator door. At least two small openings should be pro-

vided at the very top of the cellar wall, always in the outside walls. At least one, and, where possible, two one-half cisterns should be dug on the outside of the foundation down to the floor line of the basement. Openings should be made through the walls at this point. Both the top and bottom openings should be made in such a way that they can be closed practically airtight or opened at will. Ingress has now been provided for the cold outside air and a place likewise prepared for the escape of the air that has become warmed. The management of the storage is now a simple matter.



A "DUG OUT" OR HILLSIDE STORAGE

On cold nights both the upper and lower windows should be opened wide, and even the entrance door may be thrown open if a screen or slat door has been provided to keep out intruders. The warm air of the cellar is quickly crowded out by the cold air from the outside. In the early morning all

openings should be shut perfectly tight. This holds the cold air throughout the day, and even for several days if the door is not opened too frequently. This treatment should be repeated every night when the outside temperature is lower than that of the storage. When severe freezing weather exists it may be necessary to keep the openings closed the most of the time in order to prevent freezing. Even under these conditions some ventilation should be given in order to remove the foul and stagnant air, replacing it with the cold fresh air from the outside. With a little care this can be done without chilling or freezing the vegetables in any way.

Where the entire cellar is not desired for storage purposes a small room may be partitioned off from the furnace or work room, complying with the above requirements and giving excellent satisfaction. It is difficult to understand why so few people, owning their own homes and in almost every case with basements under the entire house, have yet provided no place for the proper storage of fruits and vegetables. The result is that these supplies are bought from day to day for double and quadruple the price they could be secured for in the fall of the year if some satisfactory place was provided where they could be stored without serious loss. The utter lack of any storage facilities in many city homes is to a very great extent responsible for the present high cost of living.

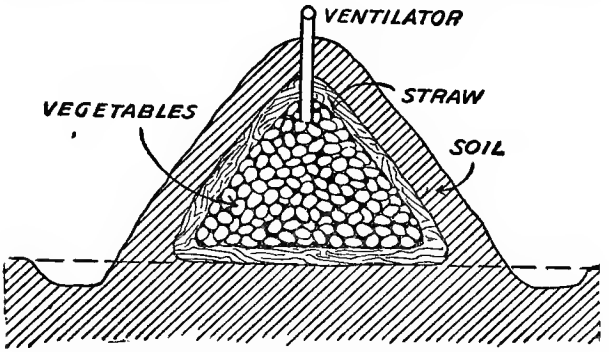
The outside cellar is another form of storage deserving of especial mention in connection with the truck and home gardens. This type is at its best where it can be made in the side of a slope. Here it is commonly known as a cave or dugout, The construction is comparatively simple and the

principle of management exactly the same as that described for the house cellar. A room of the desired dimensions is dug out of the soil and usually walled with brick, stone, concrete or block. The roof is made of heavy timber, or still better, with iron girders and reinforced concrete and covered over to the depth of from two to four feet with soil. A ventilator for every 10 feet the room extends backward from the entrance should reach from the roof to the surface of the ground. The ventilator may be very easily constructed out of ordinary drain tile or sewer pipe from three to five inches in diameter. The top of the ventilator should be covered in such a way as to prevent the rain falling into the opening, yet allow ready escape of the warm air from the room below. The entrance door should, of course, be double, as described for the cellar. In a storage of this kind, moisture and temperature conditions are usually more uniform than in the cellar.

The outdoor cellar may be constructed entirely above ground if desired by making both walls and roof of well-insulated construction. Directions for building such houses can easily be secured from architects or from publications dealing especially with these types of houses.

Pits are available methods of storage worthy of consideration by the vegetable gardener under all conditions. Many vegetables, and especially those, the edible portion of which grew in the soil, can usually be stored in a very satisfactory manner by this method. In the construction of the pit for the storage of potatoes, beets, carrots, parsnips, turnips, etc., a well-drained location should be selected. If the soil is decidedly gravelly or sandy in char-

acter it may be excavated to a depth of 10 to 15 inches. If the soils are comparatively heavy it is better to place the vegetables directly on the surface without excavation. In either case three or four inches of clean straw should be placed upon the soil and the vegetables placed upon this material. Care should be taken not to pile too many vegetables of any kind together. The base of the pile should usually not be more than four feet wide,



A GOOD VEGETABLE PIT

and the vegetables then piled about as high as possible in conical form. Where large quantities are to be stored, the pile can be extended in length as far as necessary.

After the vegetables are properly piled they should be covered with two or three inches of straw and then with two or three inches of dirt. An ordinary drain tile should be placed at intervals of every five or six feet, and extend above the surface of the soil. Care should be taken not to cover too deeply during the mild weather of late fall and early winter. As a matter of fact, more fruit and vegetables are

destroyed in pits by over-protection than by under-protection. The first layers of soil may be allowed to become solidly frozen before more is added. In most sections of the country eight to 10 inches of soil should eventually be added, and when necessary further protection may be provided by covering with straw or corn fodder. It is a common plan where potatoes or other vegetables are to be held late in the following spring to cover the pits heavily with straw or corn fodder after the soil has become solidly frozen and covered with several inches of snow. This provides a sort of a cold storage plant and greatly extends the season during which such vegetables may be profitably held. The principal things to be remembered in pitting is to provide thorough drainage and ventilation and avoid over-covering.

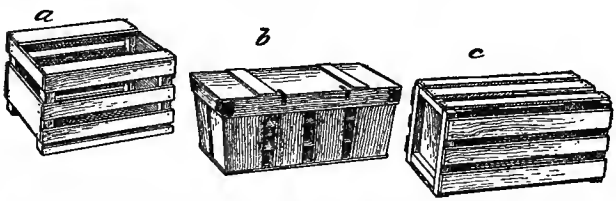
CHAPTER X

Marketing

The problems of marketing are, of course, comparatively unimportant in connection with the home gardens. The principal object in view here is growing an abundant supply for home use. However, it oftentimes happens that a considerable surplus is available for sale and the income derived from the same has awakened and stimulated an interest in gardening from a commercial standpoint and finally developed into a large business enterprise. In commercial gardening successful marketing is the keynote to success, and is even of greater importance than successful production. It does not necessarily follow that a good grower is a good salesman, but with some attention to this end of the business reasonably good results should be secured by any active, wide-awake individual. Generally speaking, there are two classes of markets open to the grower —the general or wholesale market and the personal or direct.

In the wholesale market the products are sold or consigned direct to the wholesale houses, which in turn redistributes them to the retailer, who in turn distributes them to the final consumer. By far the larger amount of vegetable products are handled by this type of market, and in the large distribution of these products the present or a similar wholesale plan seems to be indispensable. The present lines upon which the wholesale business is organized, especially upon the consignment plan, are

altogether one-sided, however, and have been responsible for a great deal of dissatisfaction upon the part of the consignor. The shipper takes all of the risk and receives what is left after all other expenses along the line have been met. The one-sided character of this arrangement has attracted many dishonest and unscrupulous people into the business who have taken an unfair advantage of the situation and reflected their dishonest methods over the en-



a. Square bushel crate. *b*. 6-quart carrier. *c*. Rectangular bushel box.

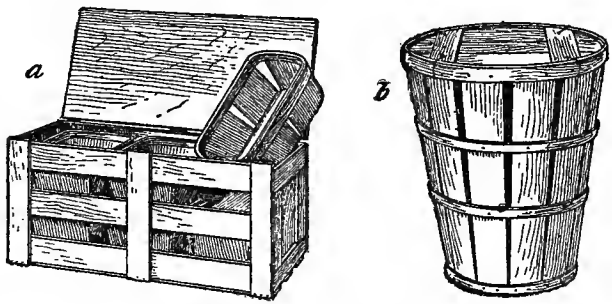
tire business. The oft-heard statement that there are no honest commission men is, of course, fallacious, and the sentiment prompting it is to be deplored. As a matter of fact, the percentage of rogues and honest men to be found in the commission business will, perhaps, compare very favorably with the percentages of such to be found among vegetable growers, especially if methods of grading and packing are to be taken as an indication of the native honesty of the producer. Much of the dissatisfaction in dealing with commission men could be largely obviated by the practice of a little common business sense in our relationship with them.

Before shipping to a commission house some investigation should be made of its standing and reputation. The house itself should be visited and the

shipper should become personally acquainted with the persons who are to dispose of his products. This personal acquaintance, whenever possible, should be kept up by frequent visits. These will have a two-fold advantage. It will have the tendency to stimulate commission men to be more prompt and careful in the handling of shipments and will give the shipper an opportunity to learn many things in regard to the preparation and packing of his products in order that they may arrive in the markets and be offered in the best possible condition. More marketing knowledge can be secured by frequently following one's own shipments to market and watching the disposition of them than in any other way. Once a commission man has been selected, take his advice in regard to the best packages for the market, the best methods of packing, time of shipping and any other points he may mention. His long years of experience have placed him in a position to be a much better judge of the markets and their requirements than the average shipper can ever hope to be. The tendency to sell outright to the commission man is on the increase every year, yet is often done at a great reduction in price over what the markets justify.

In buying perishable products outright the commission man must be prepared to meet some heavy losses once in a while, in the way of wildly fluctuating prices or spoiled materials. Daily reports, either by telegram or telephone, should be demanded of the commission house, and it is oftentimes quite as important that the grower inform the commission house at least twenty-four hours beforehand of any probable shipments likely to arrive. Some disappointments in returns must be expected from

time to time, even under the best conditions of marketing. Vegetables are perishable, and heavy and sudden gluts of the markets are of common occurrence. Fluctuations often occur overnight, impossible of belief by the shipper a long distance away. During the present season in the Columbus market good string beans were selling one day at from $1.25 to $1.75 per hamper. The



a. Six-basket carrier. *b*. Hamper.

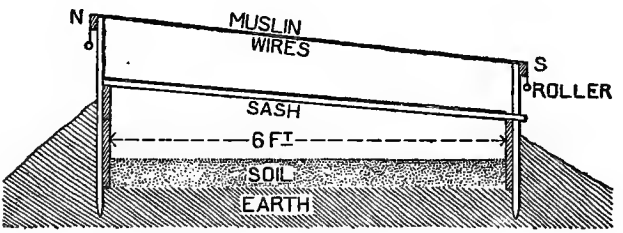
following morning beans of similar quality could scarcely be moved at all at 25 and 50 cents per hamper, and many hundred hampers were dumped at a total loss to the grower. It would be almost impossible for a commission man to explain this situation satisfactorily to any shipper not close enough to get this information at first hand. So much has been said and written about the methods employed by the commission men to rob the producer of his rightful returns that the side of the honest commission merchant has been almost entirely overlooked, very much to the ultimate detriment of the producer as well as to the wholesale business itself.

The most hopeful signs of the time, from the marketing standpoint, is not that more or less produce is going through the hand of the commission man or that more or less is being sold direct to the consumer, but that the grower is giving more personal thought and attention to this end of the business and is selecting and planning for his market campaigns along much more intelligent lines. The more or less unsatisfactory relations long existing between the commission men and producers, and the one-sided nature of the transaction has caused many plans to be originated and tried out for the solution of this difficulty.

Two principal avenues of escape present themselves. First, the formation of co-operative selling associations; and, second, direct or personal marketing. The advantages and disadvantages of co-operative selling when properly managed cannot be questioned, but room can hardly be taken in this little volume to discuss this matter except to say that these co-operative efforts are becoming more and more numerous each year and a larger percentage of them are every year proving successful.

Direct marketing appeals especially to the gardener upon a small scale, and while it has many points in its favor is not without some serious objections. The net profits per unit of measure are usually larger than in the wholesale market. A personal relationship is established between producer and consumer, making it possible for the transaction to be more remunerative to the grower and more satisfactory to the consumer. If high-class materials are furnished competition is almost eliminated. Upon the other hand, direct marketing requires considerable ability along the lines of sales-

manship and takes considerable of the grower's time away from the producing end of his business, which oftentimes suffers as a consequence. If the latter condition prevails, quality declines, which immediately brings about serious difficulty in holding old customers and securing new. In selling and building up a satisfactory direct trade a few points are worth remembering. First of all, a neat and attractive horse and wagon should be provided, or in these later days possibly an auto truck. All vegetables should be carefully graded and placed in neat, attractive packages. Onions, radishes, beets



COLD FRAME WITH MUSLIN COVER

and similar vegetables should be neatly bunched and tied in such manner as to prevent their becoming loose. It is to be remembered always that high quality is absolutely necessary and that it must be maintained whatever else befall. The route must be gone over regularly, it matters not what the weather may be, for through rain, snow or sunshine people get hungry just the same, and if the customer has depended upon a supply of fresh vegetables that do not arrive until the following day the chances are that a customer has been lost who will be very difficult indeed to regain.

The direct market requires a great variety of materials. This is in direct opposition to what is commonly found best in the wholesale market, where only a few well-known varieties of any given product are ordered. A constant supply throughout the entire year is of prime importance, otherwise the customers gained through a portion of the season will be largely lost by the time another year rolls round. One must so plan as to have something to sell to his customers the entire year through. This is not as difficult as it sounds at first thought, and is absolutely essential to success.

Another market, half way between the wholesale and the direct, might be called the semi-direct. This includes hotels and restaurants. These institutions are very particular both as to the quality and the quantity they desire from day to day, but when these demands are satisfactorily met excellent prices can be secured. The knowledge and the ability to intelligently select that particular method or methods of marketing best adapted to a given locality are without doubt the keynote to success. While many advantages are obtained by the commercial gardener close to the larger cities, many of the towns and smaller cities are important markets for large quantities of vegetable products. They are not likely to be so discriminating as the larger markets, yet appreciate good quality and are willing to pay an advance price to secure the same. Gluts and sudden breaks in prices are not nearly so common in the smaller cities as in larger centers of population. The tendency is for everyone to ship their products to the larger markets and entirely overlook the needs of small places that are forced to secure their products by redistribution from the

larger centers at an increased cost as well as a loss in quality. As a matter of fact, few gluts occur in many markets that might not have been prevented by a proper distribution of the products involved. Over-supply usually means uneven distribution. A wide knowledge of marketing conditions and better information regarding supply and demand upon the part of producers themselves will obviate much of this serious loss in the future. Summer resorts frequently offer splendid opportunities to the market gardener. Large quantities of fresh fruits and vegetables will be consumed by the transient population if they can be had of good quality. The class of people visiting these places are usually amply able and willing to pay good prices for high-class products.

CHAPTER XI

Greenhouses

The greenhouse might be described as a large flat shed with the roof and ends covered with glass and heated with steam or hot water pipes. The framework is made as light as possible and yet be able to carry the necessary amount of glass, in order that the maximum amount of light may be permitted to enter the house and reach the growing plants. Greenhouses are rapidly increasing in popularity among vegetable gardeners and in many sections the industry of growing vegetables out of season under glass has reached large proportions. As a matter of fact, there is scarcely a city or town of any size throughout the country that is not provided with its greenhouse of greater or lesser size, at least a portion of which is devoted to the growing of vegetables during winter months. The value of the greenhouse in connection with large out-of-door operations can hardly be overestimated. It provides profitable work for the gardener and his help throughout the winter months when little can be done out of doors. It enables him to keep in touch with his trade throughout practically the entire season, thus giving many advantages from the marketing standpoint. The northern gardener is in this manner able to compete with his southern competitor on account of his nearness to market and the higher quality of his products. The direct cost of production is, of course, considerably higher under glass than in the open. The greenhouse may likewise be

advantageously used in many cases in starting and preparing plants to be finally removed to the field. The object to be kept in mind in the construction of a greenhouse is first of all the securing of the maximum amount of light.

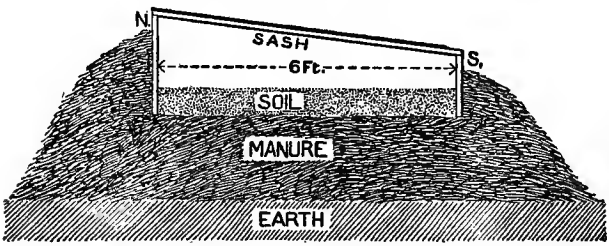
It must be remembered that plants are to be grown during the short days of the year, and when the maximum of cloudy weather is to be expected. The house must be so constructed as to make possible the economic maintenance of a proper degree of heat. Provision must be made for a cheap and adequate water supply. One must provide for ventilation without serious loss of heat and without sudden and violent changes of temperature.

In order to secure the maximum amount of light in the greenhouse it is necessary to use as light material as possible in its construction. Sash bars of cypress or some other lasting wood are usually employed. These bars or strips are properly rabbeted to receive the glass and are usually from 1½ to 2 inches in depth by 1¼ to 1½ inches in thickness. When possible, they should be cut the length of the house slope. This can usually be done in the smaller houses, but in some of the larger houses now being constructed one and even two laps are often necessary.

Gas pipe is preferable for supports of all kinds, because of its small size and great strength. Less light is eliminated than by the use of many other available materials.

The pitch of the roof is a matter of great importance and this will vary considerably with the latitude in which the structure is to be located. During the winter months, when the greenhouse is in most active use, the sun is at the lowest

point in the horizon. The best results will be secured with the angle of the roof at such a position that the sun's rays will strike as nearly as possible at right angles. More light and heat pass through the glass and the maximum results are secured. In the vicinity of Columbus an angle of from 34° to 36° in roofs facing the south will be found to give the best results. The amount of slope is also modified by the probable snowfall during the winter months. In those regions where the snowfall is generally heavy, steeper roofs must be constructed in order to avoid breaking glass. The direction of the slope is also a question of great



ABOVE SURFACE HOTBED

importance, yet one upon which it is impossible to get greenhouse builders and managers to agree. The slope to the south gives the most intense heat and sunlight, but this is generally concentrated at the middle of the day when least needed and poorly distributed during the morning and evening hours.

It will generally be found more satisfactory to run the houses of the even span type, especially when built on the ridge and furrow plan, north and south, with the angle of the roof from 40° to 45°. With this construction, the sun's rays strike more

nearly at right angles during the morning and evening hours, and the greatest amount of reflection is secured during the middle of the day when there is likely to be an excessive amount of heat.

Two methods of heating are in common use—hot water and steam. Each method has its advantages and disadvantages. The first cost of installation is considerably higher in the case of hot water, but the cost of maintenance is usually less. Hot water pipes retain their heat for a much longer time, but on the other hand heat up much more slowly than the steam pipes. In case of serious trouble with the heater the hot water in the pipes may be able to sustain sufficient heat to protect the plants until repairs are made. Steam pipes cool off almost immediately when the formation of steam ceases and serious damage may result in case of a breakdown.

The nature of the heating will depend to a considerable extent upon whether the pipes are to be placed overhead or under the benches. Hot water pipes must be very much larger than those used for steam and when placed above the growing plants cut off a large amount of light, and on account of their additional weight render heavier construction necessary. Steam can be satisfactorily carried much longer distances than water, but requires more constant care. The first cost is less, however, and repairs are less troublesome to make.

The size of the pipe will, of course, vary with the lengths of the run and the amount of radiation required. The minimum-sized pipes commonly used with hot water are 1¼ inches in diameter and with steam three-quarter inch. The ratio of size of pipe to radiation and glass surface has all been carefully

worked out by engineers and is to be had for the asking from any firm of greenhouse builders.

The arrangement of beds and walks is a matter of prime importance and should be planned before the construction of the house is begun. Care should be taken that the least possible amount of waste space occurs and that the widths of beds and walks, together with their location, are such as to facilitate the work of management in the best manner possible. Usually a minimum width for a vegetable house permitting of economical arrangement of beds and walks is 30 feet. The width may be increased if desired, but should rarely ever be less than this distance.

Beds may be either raised or solid. The raised beds are simply benches raised from two to three feet above the ground level and carrying from four to six inches of soil, in which the crops are grown. The heating pipes are usually carried underneath the beds. The solid beds are in most common use in the vegetable houses. They may be built either with or without sides, maintaining the natural ground levels or being raised from 12 to 18 inches above it. If the soils are of the proper texture they are simply improved by the additions of manures and commercial fertilizers. When they are not desirable in any respect the surface layers are removed and the desired composts placed in the beds. Solid beds are much more easily controlled and generally give much better success, especially in the hands of the novice. It is not uncommon in many of the larger houses to have them so arranged that the manure may be hauled in and spread directly over the beds from the wagons and the soil plowed and prepared just as is done under out-of-

door conditions. Formerly, it was the plan to remove and renew practically all the soil each year, but at the present time the soils remain indefinitely, being thoroughly disinfected at least once during the season and sometimes oftener.

Watering must be provided for. In the small houses satisfactory work may be done with the common hose, but in the larger houses this method becomes practically impossible and a system of overhead pipes is almost universal.

CHAPTER XII

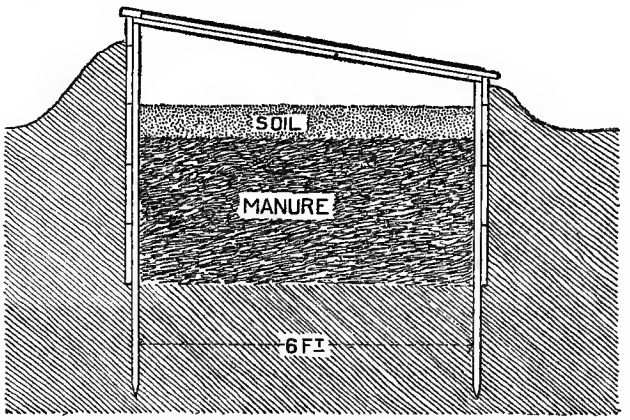
Hotbeds and Cold Frames

All commercial gardeners consider glass indispensable in the production of most vegetable crops. The term glass is here intended to include the various types of hotbeds, cold frames and greenhouses in common use. While it is true that many crops, as sweet corn, peas, beans, cabbage, cauliflower and most of the root crops, are often grown at a profit without the use of glass, it is likewise true that glass is indispensable in connection with the growing of lettuce, cucumbers, tomatoes, melons and many other crops of lesser importance. Hotbeds and cold frames are generally temporary structures used during the early and late part of the season to prolong the same and to hasten the growth of plants. They are also frequently used to grow crops to full maturity during the winter season when it is not possible to produce them in the open. They are in almost universal use for starting young plants to be eventually transplanted to field conditions. They have the added advantage of employing labor in an advantageous manner during the dull season.

These structures may be made extremely profitable in connection with the home gardens, but are not found in as common use here as their merit deserves. By their proper use a fresh supply of vegetables, such as lettuce and radishes, might be secured for home use long before the ground could even be prepared for planting out of doors. Plants may be started in such a way as to greatly hasten

their time of maturity and greatly increase the kinds and varieties grown. In the fall of the year they may also be used to prolong the season of fresh vegetables up to almost the holiday season.

The hotbed, as its name indicates, requires some heat for its proper management. The most common source of heat is fermenting organic matter, usually fresh horse manure. The frame for the bed may be made of wood, concrete, stone or brick. Wood is most commonly used, although the construction of permanent hotbeds with concrete is becoming much more common. The frame may be of any desired length, and usually six feet in width. The frame should face the south and have a slope of about six inches from the back to the front. Crossbars should be placed at frequent intervals. The construction will usually be more rigid and satisfactory if these crossbars are placed three feet apart, which is the common width for the sash.



A WELL-MADE HOTBED

In purchasing or constructing sash the most durable woods should be secured, cedar or cypress being preferred. White pine is often used, but does not last as well as the above woods and begins to loosen and rack earlier, causing considerable loss from the breaking of glass. The sash should be kept well painted and when properly stored and handled will last for many years.

Both single and double-glazed sash are upon the market and both have their advantages and disadvantages. Double-glazed sash reduce the labor of managing the frames and permit the plants to receive the light during the entire day. On the other hand, double sash are much heavier to handle, which becomes a serious objection when large numbers of them are used. The cost is from one-third to one-half more for the double glazed. The moisture and dirt accumulate between the glass of the double glazed, thus greatly reducing the amount of light entering the frames, which results in poor growth. In general, it may be said that where a few sash only are required double glazed will probably give the best results, but where large numbers are used single glazed will be more satisfactory.

When manure is used as a source of heat, an excavation is usually necessary to receive it, and the first essential at this point is good drainage, either natural through a gravelly subsoil or artificial. The pit should be dug in the fall before the ground is frozen and a few inches of leaves or strawy manure placed in the bottom. It should be the same width as the frame and of any desired length, but usually some multiple of three. The depth of the pit will vary with the latitude and the part of the season through which it is expected to

run. If hotbeds are to be put in operation in the North much before March 1st, the depth should be from 18 to 24 inches. If to be used after March 1st from 12 to 15 inches will be ample. Tender plants, as the tomato, eggplant, pepper, and so on, require higher temperatures, and, therefore, require deeper pits.

The nature of the manure will also have something to do with the amount required. The manure from grain-fed horses is usually best when it can be secured. From two to three parts of excrement to one part of litter gives the best results. If the material consists almost entirely of the solid excrements, fermentation is too violent and of too short duration to be satisfactory. Preparation of the manure should begin about two weeks before the time when the beds will be wanted for use. A covered shed or barnyard is necessary in the proper preparation of the manure for best results. The materials to be used should be made into piles four or five feet wide, about four feet high, and of any length sufficient to furnish an adequate supply. When the manure is placed on the pile it should be spread uniformly over the entire surface and well tramped. If quite dry, some water should be added. In a few days the pile will begin to steam and when fermentation is well under way it should be repiled, working the outside of the first one to the center of the second. In two or three days the entire mass begins to get hot again, at which time the pit should be filled. In filling the pit it is quite important that the material be spread uniformly over the entire surface and well compacted, especially along the edges and corners of the frames. The material will settle several inches and allow-

ance should be made for this fact when filling. After the manure has been placed in the pit to the proper depth it should be covered with four to six inches of good garden soil. The heat runs very high for a few days, after which it begins to drop.

Neither seed nor plants should be placed in the bed before the temperature falls to 90° Fahr., or less. The frame is usually banked with manure around the outside in order to afford additional protection. When the hotbeds are to be run during the winter time, or in the more northern portion of the country, it is common practice to dig the pit about a foot wider than the frame in all directions. The portable frames are then placed on the top of the manure and the frame banked around the outside with the same material. This plan requires considerable manure, but furnishes more heat, which lasts for a longer period.

The manure from the spent hotbeds is used for composting and fertilizing purposes where large amounts of nitrogen are not essential or where it may be applied in some other form.

Hotbeds are frequently constructed in such a way that they may be heated by a system of flues leading from a furnace burning coal, wood or any other convenient fuel. The flue-heated hotbed has the advantage of giving the operator more perfect control over the heat, and is not troubled with temperature falling below the safety point before the plants are sufficiently mature or the season safely advanced. In connection with greenhouses, hotbeds are frequently constructed in such a way that they may be heated by steam or hot water from the general greenhouse heating system.

Cold frames may be described as hotbeds without

heat. They are used as winter protection for many semi-hardy plants and late in the spring and early in the fall they can be depended upon to give the necessary protection during the cool days and nights of these seasons. They are used by the commercial gardener very largely for the purpose of hardening seedlings and preparing them for transplanting to field conditions. The location of both hotbeds and cold frames should be selected with some care. A sunny exposure is always to be preferred, and windbreaks of some kind should be provided. The natural topography of the land will sometimes be sufficient, but advantage may be taken of a row of trees or buildings with good results. If none are present, a good board fence, or if nothing better can be provided, one made of corn fodder will serve the purpose satisfactorily.

In connection with the use of single-glazed sash, it is necessary that mats or coverings of some kind be used as additional protection during severe weather. Mats of various kinds are upon the market for this purpose, but with a little ingenuity rye straw mats may be made at home with little cost that will fulfill all requirements in this respect.

CHAPTER XIII

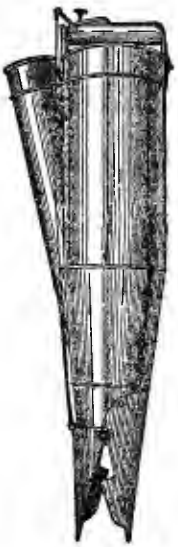
Seeds and Seeding

The value of good seed in vegetable gardening can hardly be overestimated. On account of the high price of the land usually employed, and the heavy expenses per acre involved, securing a good stand of plants is of much greater importance than with the ordinary farm crops. The most successful gardeners have always appreciated the value of obtaining the best available seed, but the real importance of this practice has not been fully appreciated and understood until recently. The primary essentials of good seed are purity, vitality and genuineness or trueness to name.

Vegetable seeds are usually comparatively free from impurities. Few weed seeds are to be found because of the manner in which most vegetable seeds are harvested. Sticks, stones, chaff, broken stems, seeds, etc., are of more common occurrence, but their presence is usually evidence of imperfect or careless cleaning. In general, it may be said that the serious prevalence of impurities in most garden seeds may be taken as direct evidence of dishonesty or extreme carelessness in cleaning. Impure seed carries with it many disadvantages. Poor stands will be secured, because not as much actual seed is sown as supposed. Several dollars per pound will not be considered an exorbitant price to pay for the seeds of many vegetables, but these figures are high for weed seed, dirt and trash. In connection with impurities it is well to remember always that certain kinds are to be looked upon as so much inert

or valueless matter, while the presence of obnoxious weed seed is an entirely different matter. Not only has a very high price been paid for this material, but weed pests may be introduced into the garden which may never be completely eradicated and cause untold losses.

The vitality of the seed has to do with its power to germinate and grow, and it is at this point that the vegetable gardener is most likely to suffer. Many seeds lose their vitality very rapidly, and all seeds lose it sooner or later. The onion and parsnip rarely germinate satisfactorily after the first year, while cucumber, melon and squash may give satisfactory results after eight or ten years. In every case, however, the percentage of vitality decreases from year to year until lost entirely. There are many reasons for the total or partial loss of vitality in seed, some of which are not visible to the naked eye. Thorough testing of the seeds for vitality before planting becomes absolutely essential if the best results are to be secured. Seeds are sometimes gathered from immature plants or the plants have been injured by insects or diseases during their season's growth. They may have been stored too wet or they may have been frozen before thoroughly air dried. In the drying process they are sometimes overheated, although this rarely occurs except where artificial heat is used.



HAND TRANSPLANTER

Another way in which gardeners suffer serious loss is by seeds of high purity and vitality failing to come true to type or name. Few, if any, gardeners would be able to tell the difference in appearance of the seed of Jersey Wakefield and Charleston Wakefield cabbage, yet these different varieties are distinct and would naturally be selected to meet definite conditions of soil and market. Heavy losses would often be incurred by planting the one instead of the other. At this point the planter is hopelessly at the mercy of the seedsman, except in so far as he selects and saves his own seed. Purity and vitality may be readily determined with little trouble and expense, but the crop must be grown in most cases before lack of genuineness can be discovered. Then, of course, it is too late to remedy the difficulty and serious losses follow. In this connection it should also be remembered that there are frequently many strains within varieties, themselves peculiarly adapted to certain conditions and making all the difference between splendid profits and probable losses. Carelessness in handling frequently results in much mixing of varieties, which, although each may be good within itself, naturally brings about dissatisfaction and heavy loss.

For the above reasons seed testing has become a common practice by all progressive gardeners, large or small. As stated before, impurities are not a serious matter in vegetable seeds, but where a preliminary examination shows their presence the amount may be determined by weighing out a good-sized sample of the seed in question. The sample should then be spread out on a smooth white surface where the impurities can be easily separated

from the good seed. All broken or mechanically injured seeds should be considered as impurities, but shriveled and imperfect seeds should be placed with the pure seed. After separating the impurities it is better to reweigh the pure seed because of the larger quantity and then compute the per cent of impurities present.

A vitality test is now in order, and is made by taking a given number of the pure seed, large, small and imperfect, as they come, usually one hundred in number, and placing them under proper conditions for germination. These conditions are secured in various ways and should be of such a character that moisture and temperature are fairly well under the control of the operator. The sand box is generally used for the good-sized seeds, such as peas, beans, cucumbers, squash, etc. This consists of a shallow box of convenient size, say two or three feet square, filled with clean, sharp sand. The surface of the sand may be laid off in parallel blocks by stretching string or wire across the top in both directions, making squares of whatever size may be desired. The various seeds to be tested are counted out and placed in their respective squares and a cloth spread over the top and covered with sand from one-half inch to an inch in depth. The whole is then thoroughly moistened and the box placed in some location where a uniform temperature of from 60° to 70° may be maintained.

The seeds should be examined the second or third day and all sprouted ones removed and a record made of the same. The test should run for about ten days for most seeds, and they should be examined daily and the sprouted seeds removed. This, of course, is easily done by rolling the cloth

back, which leaves the seeds exposed to view. A comparatively simple and inexpensive tester, especially for the smaller seeds, may be made by using two dinner plates and two pieces of cloth, preferably flannel. One piece of cloth is moistened and spread over the first plate, the seeds are counted and placed in position on the same. The other cloth is moistened and spread over them and the second plate inverted over all. The inverted plate prevents the drying out of the cloth, and with occasional sprinkling sufficient moisture is retained for satisfactory germination. Several samples of small seeds may be germinated at one time by this apparatus. In large gardens specially prepared germinators and ovens may be found desirable. The principal thing to be remembered, after all, is to keep the seeds moist and comparatively warm, yet in such a condition as to allow a free circulation of air about them. Most beginners keep the seed too moist for best results. The temperature of the ordinary living room (68° to 70° F.) will be satisfactory for most seeds.

The difficulties sometimes encountered in securing satisfactory seed has led many people to believe that better results may be secured by saving their seed at home. Except under rare conditions, this assumption is very likely to prove fallacious. This is especially true of the average home gardener as well as the small truck gardener. The seed business is a highly specialized one and requires years of experience and training to successfully conduct the same. Commercial seeds are usually grown under the best conditions for their growth and development, which is not generally the case when grown indiscriminately in the gardens of the country.

The fundamental principles of breeding and selection necessary to maintain a strain or variety in its original purity, to say nothing of improving the same, are not sufficiently well understood by the average gardener. Again, the land usually devoted to home or truck gardening is usually too valuable to be devoted to seed growing. Upon the other hand, there will be occasional instances where the small grower, and especially the large commercial gardener, will have sufficient training and experience to make the necessary selections and be able to build up particular strains of many varieties especially well adapted to his own local conditions. After all, the chief objection to home seed growing is the fact that the seed crop is not generally looked upon as a money-producing crop, and in the rush of the season's work is usually neglected, resulting in seeds of poor vitality and crops of low vigor and unsatisfactory yields.

Whether seed be saved at home or bought in the market, it is highly important that it be the best of its kind. Poor seed is dear at any price. The question of a few cents or even dollars per pound is of little importance as compared with the difference in value of a full crop of high quality and a poor crop of inferior quality. A practice all too common (the tendency toward which constitutes one of the chief objections against home seed saving) is that of saving the seed from the inferior fruits left at the end of the season. The writer has observed commercial cantaloupe growers, time after time, going over the fields after the good melons had been harvested and frost had killed the vines, saving the seed indiscriminately from the partially mature and worthless fruits left in the field. Little wonder that the

LIMA BEANS GROWING ON POLES

BLANCHING CELERY BY THE USE OF VENEER

Note the overhead pipes of the irrigation system

yield falls off and the quality deteriorates. Everyone knows how common a practice it is to save the largest tomatoes for seed, selecting them after they have been taken from the vines, with no attention whatsoever as to the characteristics of the plant as a whole. A good average-sized tomato from a plant producing a heavy yield of such fruit is far more valuable for seed purposes than a plant producing only one or two large fruits. It should be especially remembered that the characters of the entire plant must be taken into consideration, and that seed should be selected with this in mind. When purchasing seed, only the best and most reputable seed firms should be patronized. It is well to avoid the seeds usually found for sale at the hardware store or the corner grocery. With a few exceptions the seeds of the most reliable firms are not offered for sale at these places. Novelties should be bought sparingly, and it is never wise to make any large planting of any new and untried variety. Upon the other hand, it is always a good plan to try out in a small way some of these new things as they are offered to the trade. Once in a while something will be found much better for the particular location than anything planted before, and under these conditions the novelty will prove extremely profitable. For persons unfamiliar with the merits of the common varieties of vegetables it will generally be a safe plan for them to make their selection from those varieties having the shortest description in the catalogs. It usually requires a half-page halftone and a half-page description to attract the attention of the average purchaser away from the standard varieties with which he is acquainted and get him sufficiently interested in a new novelty to purchase same, while

the old and tried sorts with which each one is familiar and which have proven successful under a wide range of conditions need little description and are dismissed with a line or two. The habit of changing seed, common among many gardeners, is of doubtful value, and the whole practice is based more upon tradition than upon reason. The poor results secured from seed saved at home have been largely responsible for the supposed merit of the system. Under the methods of seed saving as commonly followed, varieties and strains rapidly deteriorate and new supplies from reliable seed houses naturally give better results. With proper care in selecting seed, just the opposite should be the case. Certain strains of the various varieties may be selected, particularly well adapted to local conditions and improved upon and kept pure as the years go by. The instances, however, where this is done is the exception rather than the rule. Northern grown seeds, in some cases, do have advantages over southern grown in being somewhat hardier and are often found to mature earlier. The use of old seed is generally to be discouraged, except with those known to hold their vitality for a number of years and when properly grown and stored.

A common practice of many successful gardeners is to buy a sufficient supply of seed known to be of high quality to last for two seasons. After careful testing, the value of the seed is known and can be depended upon to give results under proper conditions. Some melon and cucumber growers prefer to use seeds two or three years of age, believing a little less vine growth and greater fruitfulness are secured. This practice is based on good plant physiology, but it is extremely easy to go too far

and secure plants so lacking in vigor that satisfactory results are not possible.

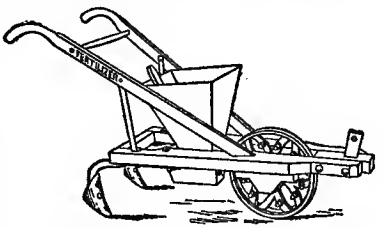
The question of seed laws and seed control is one of vital importance to the farmers and gardeners of the country. Various laws have been passed from time to time by both state and national governments, but little good has been done, except as public sentiment has demanded higher quality and better service upon the part of the seed trade. Little good can be expected from laws attempting to force people to buy high-grade seed at a correspondingly high price when they very much prefer to purchase the lower grades at a correspondingly lower price. Some regulations, however, should be in force preventing fraud and deception in connection with this business. It is unbusinesslike and unprofitable for the various state and national governments to spend thousands of dollars annually in creating and stimulating an interest in agricultural and horticultural crops, thus creating a greater demand for seeds of all kinds, if the seedsmen are to be permitted to meet this increased demand with seeds of little intrinsic value, foul with noxious weeds and impurities of all kinds. It is to be said to the credit of the seed trade generally that they are meeting the situation splendidly. Better seed is being furnished, on the average, each year, and more care is being taken in its production and handling.

At the present time in this country few, if any, seedsmen undertake to guarantee their seeds. As a matter of fact, the opposite condition prevails. Practically every package of seed, large or small, carries with it the disclaimer of the seedsman as to any responsibility whatsoever so far as results

are concerned. When sufficient public sentiment has been aroused in this problem to create a demand for guaranteed seed, seedsmen will be found ready to meet the demand as a simple business proposition. It has always seemed to the writer that this situation might be very successfully met by some slight modifications of the European seed control plan now so successfully practiced in most countries of Europe. In brief this plan is as follows: Various seed-control stations have been established by the government whose business it is to test and examine samples of seed voluntarily offered for test by the seed trade as well as by farmers and gardeners. Seedsmen are at perfect liberty to offer their seed for sale without test if they so desire, but it must be sold upon its merits without guarantee. If submitted to the station the test is made and the seedsmen may then guarantee the per cent purity and vitality for each and every package sold. If for any reason the purchaser doubts the truth of the guarantee he may take a sample according to prescribed methods, send it back to the station, where it is again examined for a nominal sum, and if it fails to come up to the seedsman's guarantee prosecution is at once begun. The value of the whole plan lies in the fact that neither the seedsman nor the farmer is compelled to have the test made, but public sentiment has been developed to such a state that the seedsman who fails to submit samples for test in order that his seed may be guaranteed finds it is impossible to sell the same to the European farmers and gardeners. The person who desires to purchase inferior seed at a low price should have the right to do so, while the person who desires to purchase seed of high

quality and of guaranteed standard and is willing to pay the necessary increased price for the same should likewise have the opportunity.

After testing the seed and determining the percentage of impurities present and the amount of seed that should grow under ideal conditions, the problems of proper planting now present themselves. The soil is the medium in which the necessary conditions for germination are secured. The three essential things to be provided are proper amounts of moisture, temperature and free air or oxygen. These can be supplied in the proper degrees only by soils in good mechanical condition, thoroughly well prepared and worked at the proper time. It is especially important that a deep, fine seed bed with a comparatively smooth surface be provided as described in Chapter III. The smaller the seed the more important is this preparation. It is often said that a laboratory test for vitality is of little value, and that such tests should be made in the soil. A second thought will show anyone why this is absolutely unreliable and impossible. One person will plant in well-prepared soils under proper conditions, while another will plant the same seed in poorly prepared soils, too wet or too dry, or at the wrong time of the season, and secure poor results. This will evidently not be the fault of the seed. The only practical and satisfactory method is to determine what the



A ONE-HORSE FERTILIZER DISTRIBUTOR

seeds may be expected to do under as nearly ideal conditions of germination as possible. It is then the business of the grower to provide these conditions in the best manner. It is always to be remembered and expected that actual results in the field will fall somewhat below laboratory tests.

Prompt germination of the seed is of prime importance. With this in mind, it rarely pays to plant seed before the soil has been warmed to the proper point to give the best germination. As everyone knows, this varies greatly with different kinds of seeds. Lettuce, radishes, cabbage and peas may be sown very early and will germinate readily at comparatively low temperatures, while corn, cucumbers, squash, melon, etc., require much higher temperatures for their proper germination. Seeds germinating promptly usually produce stronger and more vigorous plants than those in which the process is delayed for any cause. The ordinary soil dangers of diseases, rot and decay are largely obviated by quick germination. The destruction of seeds and plants by birds and rodents will be lessened as the time of germination is shortened. The weed problem is likewise less serious when seeds come up quickly, permitting cultivation to start early and weeds to be destroyed while they are yet small.

The depth of sowing must of necessity very greatly depend upon the nature and character of the seed and the physical condition of the soil and its moisture content. The manner in which the various parts of the young plantlet develop likewise has an important influence upon depth of planting. Such seeds as corn, peas and various others, throwing up a single shoot from the seed, may be safely

planted deeper than those like the bean, melon and squash which pull the entire seed up through the soil in germination. Large seeds, generally speaking, may be planted comparatively deep, while many of the smaller ones must be scarcely covered at all. Whatever the depth of planting, it is to be remembered that the object in view is to cover the seed only deep enough to secure the proper amount of moisture for germination. For the most part the tendency is to plant too deep rather than too shallow, especially in the early part of the season when moisture is usually present in abundant quantities.

The importance of compacting the soil over the seed can hardly be overestimated, and all mechanical seeding devices of the present day are provided with various wheels and compressors for this purpose. Where hand sowing is followed some direct method of compacting the soil about the seed is usually necessary for the best results.

In order to shorten the time during which the seed must remain in the soil and in some cases gain somewhat in the maturity of the crop, the seeds are soaked in clear water before planting. This practice, however, is of doubtful value in a commercial way, although something may be said in its favor where the seeds are planted by hand. Soaking in most cases softens the seed to such an extent that they are likely to be injured somewhat by the planting machines.

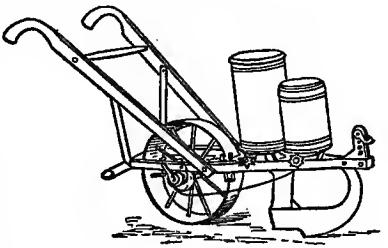
For the most part vegetable seeds are sown by means of the modern seed drills. These have been perfected to such a state that they do almost ideal work, dropping the seeds evenly and uniformly, regulating the depth as desired for all kinds and classes of seed and compacting the soil properly

after the seed has been dropped. The seed may be planted either in drills or hills as desired. Some seed, however, as squash, and a few others, cannot be readily planted by means of the drill, and must be planted by hand.

Hand planting is nearly always necessary in accurate experimental work of various kinds. The amount of seed necessary to be sown will depend upon the purity of the sample, the vitality, the nature and condition of the soil at planting time, the prevalence of insect and disease enemies, etc. It is a common practice to plant a great deal more seed than is really necessary under favorable conditions in order that good stands may be secured. Thinning is necessary, not only to give the leaves an opportunity for full development and the best exposure to sunlight and air, but to provide the proper soil area from which the plants can secure their food supply. Thinning should, therefore, be done as soon as possible after the plants are large enough to render the work practical. Early thinning avoids checking the growth of the plants to be left and prevents the wasting of available food. Thinning is done in various ways, depending upon the kind of crop. The great variety of hand weeders in common use adapt themselves as readily to thinning the smaller cultivated plants as to the removal of weeds. Onions, radishes and beets are usually thinned by hand or with some one of the very small hand implements, while cotton may be thinned by what is commonly known as "chopping out" with the hoe.

The practice of starting many plants in specially prepared seed beds and transplanting to field conditions largely eliminates the necessity for much thinning. As a matter of fact, this is one of the

chief advantages claimed for the universal practice of transplanting by gardeners. This process of preparation is accomplished in a variety of ways. Cabbage, tomatoes, lettuce, celery and eggplant are usually sown in flats or directly in the soil of greenhouse beds or hotbeds, in drills or rows. When of the proper size for transplanting to their permanent location they are carefully lifted and set by hand or by transplanting machines. These seedlings are often transplanted once or twice in the hotbeds before finally transplanted to the field. This practice has the advantage of developing a compact, much-branched root system that withstands the final transplanting very well.



ONE-HORSE SEEDER WITH FERTILIZER DISTRIBUTOR

Plants requiring a long season for their proper development are likewise started in the hotbeds or greenhouses in order that they may be ready to remove to outdoor conditions as well-developed plants by the time the seed could normally be planted directly in the soil. This results in prolonging the season for growth several weeks. Cucumbers, cantaloupes, watermelons, are often started in advance of the normal planting time by planting the seed in small squares of sod turned grass side down, or in old berry baskets, paper pots or the common earthen pots. In a small way old fruit cans may be used for this purpose after having the tops and bottoms melted off. When desired

these plants so grown can be taken to the field without disturbing the roots and will immediately start in their new location without check.

The principal thing to be remembered in starting plants under glass to be removed finally to out-of-door conditions; is to have them thoroughly well hardened off before transplanting. Under glass the young plants usually make an extremely rapid succulent growth, very easily injured by sudden removal to field conditions. This, however, may be prevented by slowly exposing them to the open air until by transplanting time they are practically growing under out-of-door conditions. Plants stunted through lack of proper hardening rarely ever recover and give satisfactory results. Various methods are in common use for the removal of plants to the field. Usually the sods, boxes or pots are placed on boards of convenient size and carried to the field, where the pots are removed and the undisturbed root system placed directly in the soil. In transplanting the smaller plants taken directly from the seed beds, a dibble is the most common tool used by the gardeners. This consists of a round or flat piece of iron or steel with a handle conveniently arranged for pushing directly into the soil. The plant roots are dropped into the opening made and the dibble again inserted two or three inches to one side and the soil pressed firmly about the roots by a backward pressure of the instrument. Transplanting may be done much more rapidly and much better by the use of this tool than with the hands alone.

In some cases the plants in the seed bed become taller than desired and special measures must be taken to place them in the soil in order to give

the best results. It is generally unwise to set the original roots at too great a depth because they will not receive the right amounts of air for their proper development, and growth is likely to be slow and unsatisfactory until new roots develop from the stems nearer the surface. A much better plan is to open up a furrow of about the usual depth for transplanting and lay the plant down in the same, covering the root and a portion of the stem, turning up the desired amount of the tip at the point where the plant is to grow. This places the roots at the proper depth for root development and new roots likewise develop very rapidly along the buried stem.

In transplanting all plants that have become rather large, it is important that some of the larger lower leaves be removed. These leaves usually dry out and drop off anyhow, and if removed at the time of transplanting transpiration or loss of moisture from the top will be greatly lessened while the roots are gaining a foothold in the soil. The practice of starting plants under glass to be transplanted to field conditions has come to be so extensive and of such an integral part of commercial vegetable gardening that in the vicinity of the larger vegetable-growing sections great enterprises have been built up in the growing of plants for transplanting purposes. It often happens in the garden business that on account of a bad lot of seed, unusual weather conditions or attacks of insects and diseases the entire crop of plants started by the gardener will be almost a total loss. These firms very satisfactorily meet such conditions and enable the gardener to avoid enormous losses. The business is a comparatively young one, but is rapidly growing and developing in the larger truck-growing centers.

CHAPTER XIV

Leading Vegetable Crops

ASPARAGUS

The asparagus plant is found growing wild in various parts of Europe and Asia, and has been under cultivation as a garden vegetable for many hundreds of years. The young succulent shoots make their appearance very early in the spring and are the parts of the plant prized for use. As a cultivated crop it is comparatively easily grown over a wide range of soil and climatic conditions. This plant should be found in all home gardens, and is becoming of increasing importance in commercial gardens every year. As a matter of fact, there is scarcely a city or town in the country that has all the asparagus it could use during its season. This is especially true of smaller towns, in many of which a very meager supply will be found at any time. While the asparagus does really well on a great variety of soils, a deep sandy loam is generally conceded to be the best for this plant. While an abundance of moisture should be present, it is necessary to avoid standing water or a water table too close to the surface. In whatever type of soil asparagus is grown a generous supply of humus is essential. As a matter of fact, it is hardly possible to supply too much of this material to soils otherwise well adapted to the crop. Stony and heavy clay soils are to be especially avoided, on account of the difficulty of cultivation and of cutting

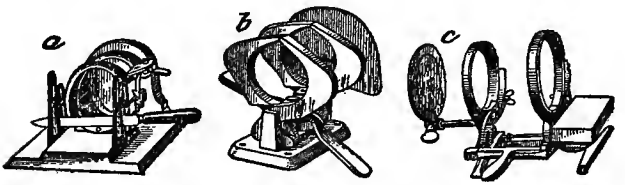
for market. Many crooked and small stalks will always be found upon such soils, which mean serious losses.

The preparation of the soil for this crop is of especial importance. While it was formerly customary to trench to a depth of two or three feet, filling in with well-rotted compost, this method has now become almost obsolete. The shallow nature of the rooting system seems to make this expensive process unnecessary. The entire area, however, should be thoroughly fined and broken to a depth of from 12 to 18 inches by the use of the plow and if necessary the subsoiler. Liberal quantities of stable manure should be thoroughly incorporated with the soil throughout its entire depth. It is usually a good plan to take one or two years in thorough preparation, growing other crops in the meantime in order to incorporate the largest possible quantities of organic matter into the soil. Southern slopes are preferable to northern slopes because they warm more readily in the spring and earlier crops are secured. Such slopes, however, are more likely to suffer from drouth.

One-year-old plants are usually preferred for transplanting. The plants should be set deep enough so that the crown will be from six to eight inches under the leveled surface. The fine branching roots should be well distributed by hand over the bottom of the furrow, before covering. The plants are usually covered only two or three inches deep at first and the furrows filled in slowly by subsequent cultivation as the stalks become larger and stronger. The rows should be from five to eight feet apart and the plants from 18 to 24 inches in the rows. The distance will depend somewhat

upon whether green or white asparagus is desired. The white asparagus requires greater distance, especially between the rows, in order that the soil may be thrown over the rows in the springtime for the purpose of blanching the stalks. Cultivation during the first, second and third years should be the same as for corn or potatoes. All weeds should be kept out and a good dust mulch maintained during the summer to conserve and hold the moisture. Cutting should not begin before the third season and then should not be continued later than the first of June. This is important, because if cutting is started too early the plantation will never furnish the large fleshy stalks so much desired by the better markets.

The asparagus plants are of two types—the staminate or non-seed bearing and the pistillate or seed



SOME ASPARAGUS BUNCHERS

bearing. These two types are found growing together and are, of course, necessary for the production of seed. Various experiments, however, have shown that the production of seed is devitalizing, and results in smaller and fewer stocks than is produced by the staminate or non-seed producing plants.

Many successful growers follow various plans of selection by means of which the percentage of the

staminate plants are greatly increased and the yields correspondingly raised. Seed may be readily saved at home if so desired and plants grown for transplanting purposes. If some attention is given to the matter of selecting the seed, securing plants by this method will prove very satisfactory.

In cultivation, especially after the first season, it is usually desirable to run over the entire patch with the disk harrow in both directions just as soon as the soil is dry enough in the spring. This hastens the drying of the surface and permits the soil to warm up rapidly, starting the new shoots into growth more quickly than they would otherwise do. Cultivation with the usual cultivating tools should be followed throughout the entire season or as long as a horse can readily pass between the rows.

The problem of keeping up the humus supply in the soil is one of prime importance. Various methods may be successfully followed. A common practice is to cover the entire patch with a heavy covering of well-rotted stable manure just after the cutting season is over. The subsequent cultivation works this material well into the soil with splendid results. Some gardeners follow the plan of plowing a deep furrow between the rows just after the cutting season is over, throwing the dirt over the crowns. This trench is filled with well-rotted manure and the whole field leveled down by harrowing back and forth across the ridges. Heavy layers of strawy manure should not be left on the patch over winter, because it keeps the soil cold and damp and prevents the early growth which is always in greatest demand. Heavy applications of commercial fertilizer should usually be employed in connection with the stable manures. Nitrogen

is the most important single element needed by the crop, but best results are generally secured by applying a high-grade fertilizer containing from four to six per cent of nitrogen, six to eight per cent of phosphate, and five to 10 per cent potash. From 500 to 800 pounds should be applied annually. A liberal application of nitrate of soda at the end of the cutting season will usually be found beneficial in stimulating a rank, vigorous growth of tops, the beneficial effects of which are seen in the increased number and size of shoots the following spring. Few crops can be fertilized so heavily and with as great profit as asparagus. From $200 to $500 is usually considered a good gross income per acre. The yield should be from 2,000 to 3,000 bunches per acre, and the price per bunch usually ranges from 15 to 40 cents per bunch, although as high as $10 a dozen bunches for extra fancy early asparagus is sometimes realized.

The relative merits of white and green "grass" are disputed points. Some markets will pay a much better price for the blanched or white stalks, while other markets prefer the green. The green stalks are usually higher in flavor and more brittle in their character, while the white stalks are inclined to be flat and woody. Once well established an asparagus plantation should remain profitable for from 10 to 15 years. Many patches are to be found yet profitable after 25 to 30 years, but as a usual thing the size of the shoots begins to diminish rapidly after the tenth or twelfth year unless unusual conditions for growth are provided.

In marketing, the shoots are always cut and tied in bundles of convenient size by the use of tape, raffia or rubber bands. The bunches should be tied

at both top and bottom, and in such a way as to keep them firm and tight until broken for use. The rubber band is especially valuable from this standpoint, because of the fact that it takes up all shrinkage and always keeps the bunches tight. If green asparagus is being produced for fancy market it is usually a better plan to break rather than cut the stalks, thus insuring absolute freedom from the objectionable woody ends.

Asparagus is comparatively free from various insect and disease enemies. The only serious insect enemy is the asparagus beetle. The beetle lives over winter in the adult form in rubbish or any other convenient protection, and in April or early May lays its eggs on the new shoots. The larvæ soon hatch and together with the adult beetles feed upon the tender stems as they appear above the ground. Various methods may be employed to control this pest. Occasional plants may be left uncut, upon which the beetles will largely deposit their eggs. These trap plants are cut at least once a week and destroyed, while others are allowed to take their place. In this way large numbers of the eggs will be destroyed before hatching. The cutting of blanched asparagus is an effective method of combating asparagus beetles because all shoots are cut off before they appear above ground. This leaves no plants for the beetles to feed upon. After the cutting season they may be readily destroyed by spraying with either arsenate of lead or paris green, preferably the former.

The asparagus rust is by far the worst enemy of the asparagus grower. This disease makes its appearance the latter part of July or first of August in the form of reddish-brown streaks and spots over

the leaves and stems, which turn blackish in a short time. The entire top begins to wither, and if the infection is at all extensive soon dies back to the ground. While the disease does not injure the cut of the season its development on the plants after the cutting period is over causes premature ripening and greatly lessens the season of growth. The result is that the roots, drained of their stored food by the heavy production of shoots in the earlier part of the season, fail to become refilled with the necessary reserve to continue the proper growth the following year. Smaller stalks in fewer numbers are produced and in a few years the plantation may be killed outright.

All tops should be carefully cut and burned in the field after the season's growth is over. All raking and forking of the tops should be done immediately after cutting, and drying permitted to take place in the piles in order to prevent the shattering of leaves and the spread of the disease. Frequent spraying with bordeaux mixture after cutting is over will be found helpful in prolonging the growing season and protecting the plants to a considerable extent from the trouble. In the regions of little rainfall dusting with flowers of sulphur has been found more effective than bordeaux mixture. Dusting, however, is not practical in the rainy districts.

A number of varieties are to be found upon the market, but the one generally preferred at the present time is Palmetto. This variety is of southern origin and does especially well in the southern asparagus districts. It has proven very satisfactory for northern growers, however, and seems to be more resistant to rust than any of the other sorts.

Other varieties frequently planted are Conover's Colossal, Barr's Mammoth, Columbian Mammoth White and Argenteuil.

BEANS

The term bean is applied to no less than eight distinct species of plants, native to widely separated countries of the world. For purposes of convenience in this discussion, beans may be divided into two general groups, viz., field and garden beans. The field beans are widely grown in various sections of the country, but are more properly considered as field and farm crops. Garden beans, as commonly grown and understood, naturally fall into two distinct groups, bush and pole beans. Under each of these divisions we have the well-known subdivisions of kidney and lima beans. Various habits of growth, form of pods, time of maturity, etc., constitute the characteristics upon which the above classifications are based. The type as well as variety of garden beans to be grown in any given locality is determined very largely by the uses to be made of them. Certain varieties are especially well adapted to use in the snap or string form, but if intended for canning entirely different varieties would be selected. The bean is cultivated wherever home or commercial gardening is followed, and is usually planted in such a way as to secure a succession of picking from early in the season until frost destroys the plants in the fall. Beans adapt themselves to a great variety of soils and will perhaps give better results on poor soils than almost any other crop. Nevertheless the bean responds to good soils and good treatment fully as well as any

other plant. Well-drained, light, clay loams usually give the best results. Many varieties of the beans, especially of the bush type, do well on light, poor soils, but high fertility is essential to large yields. Where grown to be sold as green or snap beans the brittleness and tenderness depend primarily upon rapid growth, which can only be secured upon soils well supplied with available plant food. Poor soils, therefore, will usually give better results with dry beans than with string beans. The bean is a shallow-rooted crop which requires for its economic cultivation soils apparently free from all stones and obstructions of any kind. Shallow cultivation must be practiced.

No special preparation other than that generally considered good for any crop is necessary. Liberal applications of commercial fertilizers are applied with profit, but inasmuch as the bean is a nitrogen-gathering plant this element need not be present in large quantities. Potash and phosphorus should predominate. Garden beans are planted both in hills and drills, but the latter method is more commonly followed and usually gives the larger yields. The common bush varieties should be planted in rows from 24 to 36 inches apart and a plant from every four to six inches in the row.

The bean is a warm-season plant, and planting should always be delayed until all danger of frost is past and the soil becomes well warmed. The proper depth for planting is from one-half to two inches in depth, depending somewhat upon the nature of the soil. In loose and sandy types, planting may be deeper, while in heavier soils one inch is all that is safe, especially with the larger seeded

forms. String beans are very largely grown by gardeners as catch or as succession crops.

From their nature garden beans must be harvested entirely by hand, especially when used in the snap form. Their extensive cultivation is practical only in those regions where an abundance of labor is available. After the beans are picked they are usually sorted and packed in the various types of packages found best for certain markets. The bushel and half-bushel hamper are the most popular packages.

Pole beans require the same soil and climatic conditions as bush beans, the only important difference between the two groups being in their habits of growth. Pole beans should be planted in hills from two to three feet apart in rows from 30 to 40 inches wide. From four to six beans are planted in each hill and afterwards thinned to two or three plants.

Lima beans are of two types, pole and dwarf, and are of great commercial importance from the gardener's standpoint, especially throughout the more southern truck gardening sections. The plant requires a long season for its maturity and in the northern regions the gardener is usually well satisfied if from one-half to two-thirds of the pods succeed in maturing. Farther south heavier crops are secured. The bush limas are a little hardier and for this reason are more extensively planted in the North. Their requirements are similar to those described for the bush beans, except that the limas require much stronger soils for their proper growth. Unlike many varieties of the bush beans, however, they rarely give satisfactory results on heavier types of soils. Lima beans require heavier manuring and heavier applications of commercial fertiliz-

ers than the bush types. Limas are usually planted in rows from three to four feet wide and from 18 to 36 inches apart in the rows. They are supported on either poles or trellis. When poles are used they should be from six to eight feet in height. The common practice of tying four poles together gives better support, but interferes with proper cultivation. A trellis may be readily made by driving stakes in the row every 15 or 20 feet, leaving them about four feet above the surface of the soil. A wire may then be placed within a foot of the bottom and another near the top of the stake and strings stretched from wire to wire in a zigzag manner. Lima beans are marketed both dry and green, and in the latter form both in the pods and shelled. Green shelled limas are considered quite a delicacy in many markets and bring correspondingly high prices.

The use of the lima bean is limited somewhat by the fact that many people do not realize that it can be used in exactly the same way as the small field beans, and, in many cases, with better results.

There are two common enemies of the bean of sufficient importance to deserve mention here. Anthracnose, or what is commonly known as rust, is a disease everywhere found attacking the waxed, podded types especially. Few forms, however, are entirely free from the trouble. This disease may be controlled to a considerable extent by spraying with bordeaux mixture, but the labor and cost involved prohibit its use under ordinary conditions. Special precautions should be taken to secure disease-free seed. Something may be accomplished by gathering and burning all of the affected vines in the fall of the year.

The bean is comparatively free from serious insect pests, with the exception of the bean weevil. This insect is a little beetle about one-eighth of an inch long, which eventually finds its way into the body of the seed. The adult lays its eggs in the field on the pods. Breeding continues after storage and large numbers of the beans will be found to contain the larvæ or adults of this particular insect. This insect is not a factor when the crop is marketed in the green state and its destructiveness is confined entirely to the dried bean crop. It is a much more serious pest in the South than in the North, which accounts for the fact that the growing of dry beans is confined almost entirely to northern latitudes and high altitudes. Fumigating the seed with bi-sulphide of carbon is a most effective remedy. Use at the rate of one-half ounce per bushel of seed. The seeds should be placed in comparatively tight boxes or barrels, and the carbon bi-sulphide placed in shallow vessels on the surface and quickly covered with burlap or some other similar material. The exposure should be for at least forty-eight hours. The vapor of this material is very inflammable and the fumigation should be done away from fires or lights of any kind.

BEETS

The beet is a native of the Mediterranean regions. Several forms have been in cultivation for more than 2,000 years. It is almost universally grown by gardeners the world over. Its ability to develop under cool conditions and the short season necessary for its growth make it adaptable to a very wide range of climate. There are four dis-

tinct types of beets in cultivation at the present time, all of which have originated from a single parent plant through careful selection with radically different ideas in mind. These types are the common garden or red beet, the swiss chard or leaf beet, the sugar beet and the mangel or mangel-wurzel. The garden or red beet is the form of especial interest to vegetable gardeners, although the swiss chard or leaf beet is beginning to be grown quite extensively as a potherb.

Sandy or gravelly loams well enriched and well drained give the best results with this crop. Cold soils and those retentive of moisture are not satisfactory. Inasmuch as quick results are expected from the beet, heavy applications of plant food should be made to the soil both in the form of manure and commercial fertilizers. From 30 to 40 tons of well-rotted stable manure, together with 600 or 800 pounds of fertilizer analyzing approximately two per cent nitrogen, six per cent phosphorus, eight per cent potash, should be applied. Beets are usually grown as a close crop, cultivation being done entirely by hand. The rows are usually from 12 to 15 inches apart, and after the plants are well started they are thinned to from two to four inches in the row. Some gardeners dispense with

A BUNCH OF BEETS READY FOR MARKET
Note their uniformity.

this thinning process, removing the larger beets after they become sufficiently developed for use, thus giving the smaller ones an opportunity to develop in turn.

Beet seeds should be planted from 1 to 1¼ inches deep. The seed germinates rather slowly and for this reason small quantities of lettuce or cabbage seed are frequently mixed with it in order to mark the rows and make earlier cultivation possible. The beet is comparatively hardy with reference to frost and the seed may be sown as early as it is possible to prepare the soil. Shallow cultivation should be followed at sufficiently frequent intervals to keep the soil perfectly clean and prevent the formation of crusts. The bulk of the crop of garden beets is always sold in a partially matured form in bunches of from four to six beets each. Only the dead or dried leaves are removed. They are then packed in various styles of packages for delivery to market.

The beet is becoming a popular canning vegetable and in many places is extensively grown for this purpose. For both bunching and canning they are preferred when they have reached the size of from 1½ to 2 inches in diameter. The beet is forced to a considerable extent in many localities, being especially desirable for cold frame and hotbed growing. They are sometimes grown in the greenhouse, but the possible returns from the crop hardly justify the use of the space for this purpose.

Matured beets in the fall of the year are frequently stored and handled as potatoes, and in this form are sold to a considerable extent almost the entire year round.

The beet is comparatively free from serious in-

sects and diseases. Although several pests are known to attack the plant, their numbers are rarely great enough to cause any considerable damage. The flea beetle, leaf spot and potato scab are the only enemies likely to become troublesome, and these so rarely as to need no further comment.

CABBAGE

Cabbage is one of the most widely cultivated of the plants of the vegetable family. It is a native of Europe, and the original plant has given rise to various distinct forms now in cultivation. Of these the most important are cabbage, Brussels sprouts, kohl-rabi, cauliflower and kale. The cabbage plant is a strong, vigorous grower adapted to a great variety of soils and climates, but thriving best in cool moist regions. For this reason its commercial culture is largely confined to the North. When grown in the South outside of high altitudes its cultivation is confined to the late winter or early spring months. By proper storage, cabbage can be readily kept through winter months and is now available all over the country the entire year through. It is used in a greater variety of ways than almost any other vegetable, which largely accounts for its popularity and wide cultivation. Cabbage is grown successfully upon almost every type of soil, but well-manured clay loams come nearest the ideal. For early cabbage, soils of sandy character, containing large quantities of vegetable matter, are selected on account of the earliness with which these soils may be worked and the crop started. Any mellow soil that will not bake readily and containing liberal amounts of humus will grow satisfactory crops of

cabbage. The cabbage plant is a gross feeder and requires almost unlimited amounts of available plant food.

Nitrogen is especially important on account of the heavy vegetative character of the growth. It is generally conceded that stable manures are the most desirable form of fertilizer for the cabbage, but commercial growers usually supplement heavy applications of this material with from 1,000 to 2,000 pounds of high-grade fertilizer per acre, especially on the early crops. A formula of 4-8-10 may generally be considered standard.

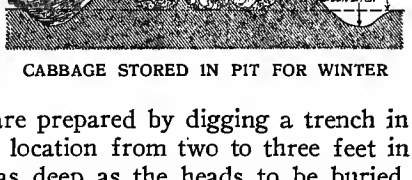
Fall plowing for the early crop is especially important. The cabbage is a hardy plant not easily injured by frosts, which makes it possible to transplant to field conditions extremely early, provided the soil is dry enough to work. Fall plowing permits the soil to become dry much earlier than would otherwise be the case. The soil is frequently left ridged or listed in the fall of the year, which still further hastens drying in the springtime, thus advancing the time when the soil may be properly prepared and the crop started.

Various methods of growing the plants in preparation for the field are employed in different sections of the country. The common method is to sow the seed in the hotbeds or greenhouses in February, hardening them off well, by the last of March or first of April, when they can be transplanted to the field in most localities, except in extreme northern sections. The plan of sowing the seed in the fall of the year and carrying the plants over the winter in cold frames gives earlier crops, but is not now commonly followed on account of the great expense of caring for the frames over such a long period of

time. Cabbage is usually planted in rows from 30 to 36 inches wide with the plants from 20 to 30 inches apart in the row. The distance will depend somewhat upon the varieties grown. The close-leafed plants of the Jersey Wakefield require much less room for their proper development than the varieties of the Flat Dutch type. It is a common saying among gardeners that the cabbage crop needs more hoeing than any other. In any case, it seems almost impossible to give the cabbage too much cultivation. Frequent shallow stirrings of the soil conserve the water supply and at the same time render large amounts of plant food available. A quick and rapid growth is necessary for the production of cabbage of high quality. In small areas the cabbage is sometimes planted as a companion crop with radishes, lettuce or spinach, but this renders it necessary to do all the cultivating by hand and greatly increases the cost of the same. It is generally preferable where sufficient area is available to plant the cabbage by itself in order that horse cultivation may be used. The narrow-tooth, shallow-cutting cultivating implements are to be preferred. The early crop is usually cut as soon as the heads are large enough to meet market requirements, which is likely to be long before it is fully matured. Much of the early cabbage is cut before the heads are sufficiently solid to hold up well in handling and results in dissatisfaction among the growers, consumers and dealers. A nearly matured head will take up about as much space as it would a few days later when it has become hard and solid, but will weigh very much less. Sales are always slow when heads are soft and loose. It may be taken as a general rule that cabbage

should never be cut until solid, except in very late fall when danger of freezing threatens. When sent to distant markets cabbages are packed in ventilated barrels or in double compartment crates. The early cabbage is sometimes shipped in basket hampers. Early cabbage deteriorates more rapidly than later cabbage on account of its incomplete development and the season in which it must be handled. In the close markets cabbage is usually handled in bulk in a satisfactory manner.

The larger per cent of the late crop is grown primarily for storage purposes and is sold during winter and early spring. Successful storing depends largely upon the variety and the method employed. There are various ways of storing cabbage, but the most common one is in pits. These pits are prepared by digging a trench in some well-drained location from two to three feet in width and about as deep as the heads to be buried. From two to five heads are placed in the bottom of the trench with the stems up. All the leaves, except any showing decay, are left on the plant and wrapped closely about the head. The next layer is placed on top of the first in such a way as to break joints. This makes a pile of conical shape satisfactory for covering. After packing the heads together in the above fashion they are covered with sufficient dirt to prevent severe freezing. As cold weather comes on, more covering is added in the way of straw, corn fodder or other similar material to prevent



CABBAGE STORED IN PIT FOR WINTER

severe freezing and at the same time make it comparatively easy to get at the crop at any time one desires to market it. For storage in pits the plants should always be pulled with the roots adhering. Cabbage will stand a considerable amount of freezing if not subject to alternate freezing and thawing.

Storage houses are employed by the larger growers. These houses must be so constructed as to prevent all condensation of moisture dripping on to the cabbage and a thorough control of ventilation and temperature must be provided. Cabbage must be kept cool, the air must be kept moist and hard freezing must be prevented.

In many sections the entire crop is hauled direct from the field to kraut factories where it is immediately manufactured. In the regions where such factories are located this insures a ready market close at hand and a large amount of handling is avoided.

Yields vary greatly, but where good methods are followed it should not be less than 15 to 18 tons per acre. Yields of 25 tons per acre and even larger over small areas have been reported. Generally speaking, early cabbage proves more profitable than late, and in addition to the value of the crop it is usually off the land in time for another crop to follow.

The cabbage has a number of serious pests, some of which frequently cause heavy losses and are difficult to combat. The cabbage worm is the most common and widely distributed pest of this plant. The adult insect is a white butterfly with conspicuous black spots on the fore wings of the female. The adult appears in the early summer and deposits its eggs on the cabbage plant. These eggs soon hatch and develop into the large green

larvæ from an inch to 1½ inches in length, covered with fine black dots. There are two and three broods of this insect each season in the North. A number of natural enemies have developed, which largely keep this pest under control, but it is often necessary to use insecticides of some kind for its direct destruction. The most satisfactory insecticide is pyrethrum or hellebore. The active principle of these powders is volatile, and the poisonous properties are lost in a few days' exposure to the air, making them perfectly safe to use. Before the plants have begun to head arsenate of lead will prove an effective and safe poison.

The cabbage louse is an insect widely disseminated over the United States, usually becoming more numerous and troublesome during extremely dry seasons. In the North the insects appear in late May or early June. They attack both the upper and lower sides of the leaves, causing them to curl and finally wither and die. The eggs are deposited on the stems and refuse leaves, where they pass the winter. One effective method of control suggests itself, viz., to gather and burn all stalks and leaves as soon as cutting is over. Kerosene emulsion seems to be the most effective direct treatment. The stock solution described elsewhere is diluted one gallon to 15 before application.

The cabbage root maggot is found attacking the roots of all cruciferous plants, but is especially troublesome upon cabbage, cauliflower and radish. The adult insect is a small fly resembling the common house fly. It makes its appearance during late April and early May, and deposits its eggs at the surface of the ground near the plant. In from eight to ten days the eggs hatch and the larva or maggot

immediately eats its way into the soft covering of the roots and the underground portion of the stem, in a short time completely destroying the plant. The presence of the maggot is usually indicated by a wilting of the affected plants during the heat of the day, with nightly recovery for a time. The plant is eventually killed outright or its growth checked to such an extent that it fails to properly mature.

In the southern cabbage-growing sections the harlequin cabbage bug is frequently a serious pest, especially on the late crop. This insect is a sucking insect, requiring contact poisons for its control, but unfortunately many of the common contact poisons used in sufficient strength to destroy the insect seriously damage the cabbage. The only effective method of treating this pest is to plant a trap crop, usually mustard, which is planted early enough to develop before the cabbage. Both crops and insects are then destroyed by spraying with rather strong kerosene emulsion.

The club root is the most widespread, and perhaps most serious disease affecting the cabbage. The trouble is caused by slime molds attacking the roots causing them to become distorted and greatly enlarged. Eventually they become unable to supply the plant with the necessary moisture and plant food. The plant becomes dwarfed and light green in color. It wilts quickly in warm, sunny weather, but for a time recovers at night. The plants sometimes mature their heads, although they are usually small. The most effective remedy is crop rotation. The spores of the disease are extremely resistant and retain their vitality for a number of years. The soils in the seed beds should be thoroughly steri-

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A very popular package for tomatoes, peppers, etc.

A HANDY WATERING DEVICE, CHEAP AND EFFECTIVE

lized in order to avoid infection at this stage. In the rotation all cruciferous crops should be dropped for a number of years. Heavy applications of lime to the soil have given good results in many cases. The infected roots, stems and leaves from diseased fields should be burned to avoid the spread of the trouble.

Black rot is a disease only recently becoming destructive in most cabbage-producing areas of this country. This disease is bacterial in its character, and once introduced into a locality spreads with alarming rapidity. It affects all the plants of the cabbage family. The presence of the disease is first noticed by a decided yellowing of the foliage. The leaves then begin to die off, the heavier veins become brown or black, rot follows and the head frequently drops off before it is mature. The presence of the disease in the field may be easily detected by the offensive odor arising from the affected plants. The only remedy seems to be a wide rotation of crops which excludes all plants of the cabbage family, and thorough disinfection of seeds and seed beds, thus insuring against infected plants at this point. Planting on unaffected soils is also essential.

The varieties of the cabbage are almost endless and many seedsmen recognize various groups or families, each of which has a number of varieties somewhat similar in their general characteristics. Jersey Wakefield is without doubt the most popular of the early varieties. Charleston Wakefield produces heads of larger size and is better protected by outside leaves and matures from three to ten days later. Winningstadt is a popular variety on account of its solid heads and fine quality. It does

not ship well, however, and its use is largely confined to home gardens. The Express, a widely advertised variety, is probably a superior strain of Jersey Wakefield. Early Summer, Succession and Surehead are all early and mid-season varieties of the flat type. Flat Dutch is a standard late variety grown extensively in many sections. For its best development it requires ideal conditions and a long season.

Of the red cabbage the red Drum Head is the standard variety. The Danish Ball Head has become exceedingly popular as a winter variety because of its excellent keeping qualities. The heads are comparatively small, but round and firm in character and very solid. The successful culture of this variety is confined almost entirely to northern sections of this country.

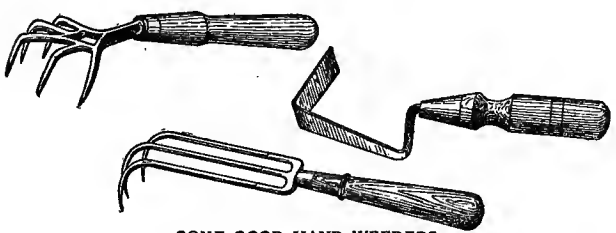
CARROT

The carrot is a vegetable of minor importance in this country. Its popularity is rapidly on the increase, however, chiefly among the foreign population. It is principally used in soups and stews, although it is now frequently served as a separate dish.

Carrots grow best on sandy loams that do not bake and become hard after rains and yet hold water with reasonable tenacity. They are usually planted in rows from 12 to 18 inches apart and cultivated entirely by means of the wheel hoes. The seed germinates rather slowly and the plant makes a slow growth in its earlier stages of development. For this reason it is a common practice to plant this seed with radish or cabbage seed in order to mark the rows

so that cultivation may begin early. It is especially important that weeds do not gain a foothold while the plants are still small. After the young plants have become reasonably well established they should be thinned to a distance of from four to six inches. Frequent shallow cultivation should be continued as long as it is possible to pass between the rows.

Carrots require an abundance of available plant food and, like all root crops, liberal quantities of potash. Fresh stable manures should never be used, as it generally results in a growth of top



SOME GOOD HAND WEEDERS

at the expense of the root. Well-rotted manures may be used to good advantage, together with applications of from 300 to 600 pounds of commercial fertilizer analyzing approximately 4-6-8 or 4-8-10.

Carrots are extensively sold partially mature, tied in bunches, as already described for the beet. They are also dug in the fall of the year, stored like potatoes and sold throughout the entire winter months. In one or the other of these forms carrots are now to be found upon the market the entire year round.

In harvesting carrots for bunching purposes they must usually be pulled by hand. In harvesting for winter storage the sugar beet puller or the plow

may be used to loosen them from the soil, after which they are gathered in piles, topped and then stored in pits or in moist, cool cellars or storage houses to be brought out upon the markets as demanded.

The carrot is remarkably free from serious insect and disease pests. In occasional seasons a leaf blight develops which destroys the older leaves, causing them to dry and drop off. This eventually prevents the development of the root of the plant and the crop is practically a failure.

Several varieties are planted, among which the Early Short Scarlet, Danver's Half Long, Ox Heart and Long Orange are the most important. The Long Orange is a late, very long rooted variety frequently grown for stock feeding as well as for market purposes. Its extreme long root makes digging somewhat difficult. The White Belgian is an extremely large sort grown entirely for stock-feeding purposes.

CAULIFLOWER

Cauliflower is perhaps the most tender and exacting member of the cabbage family with reference to soil and climatic conditions. The edible portion consists of the flower stems which have become very much enlarged and thickened by long selection. This plant in many respects may be considered the most delicate and refined member of the vegetable family.

Cauliflower requires comparatively cool and moist conditions and for this reason its commercial growth is confined entirely to the spring and autumn months and to those regions where the

atmosphere is not only cool, but well filled with moisture. The best known regions in the United States for the production of cauliflower are Long Island Sound and a few other coast locations. Many uncertainties accompany its cultivation. It is not so hardy as cabbage, and for this reason cannot be started under field conditions so easily. It is especially subject to injury by dry hot winds, and usually succumbs more readily to the ordinary diseases of the cabbage family than any other members of this group.

The soil requirements are practically the same as for cabbage, although, if any difference, even greater quantities of available food should be provided in the soil. Not less than 50 loads of well-rotted manure should be applied per acre, supplemented with from 500 to 1,000 pounds of high-grade fertilizer especially rich in nitrogen. Cultivation is not unlike that already described for cabbage.

The value of cauliflower depends upon the development of the heads and especially upon their whiteness. When the heads are exposed to the hot sun they frequently develop a greenish or purplish color, always accompanied by a loss of the delicate flavor so much desired. After the heads become well developed it is a common practice to gather up the leaves and tie them in this position over the head. This keeps out the direct sunlight, blanches the head a snowy white and develops the highest possible quality. A little experience is required in order to know the proper stage for harvesting to obtain the delicate flavor so much desired. When the heads have become too old they "break" and lose their whiteness. Cauliflower is cut in exactly the same way as the cabbage. The heads are trimmed by cutting

the leaves from a half inch to an inch beyond the face of the head. The white head is left surrounded by a fringe of stubby green, which serves to protect the delicate structure in packing and shipping.

Cauliflower is usually shipped in ventilated barrels or crates. The best heads should be wrapped with white or brown soft paper and in such a manner as to protect them from bruising as much as possible. Cauliflower cannot be stored successfully for any length of time and the supply depends entirely upon successive crops.

Cauliflower lends itself to forcing conditions very successfully and is often grown under glass or in hotbeds with considerable profit. It has the disadvantage of taking up too much space to become a popular plant for this purpose, except where high prices are well assured.

While the insects and diseases attacking the cauliflower are the same as those described under the cabbage, they sometimes seem more destructive to the former plant.

The list of varieties available for planting is not a long one. Dwarf Erfurt and Snowball are the leading varieties for spring planting, while Dry Weather and Autumn Giant are usually preferred for the fall crop.

CELERY

Celery is a native of the moist lands along the Mediterranean Sea and has come to be a garden vegetable widely distributed and used. The variety of uses now found for this plant makes it a standard vegetable in the same sense in which potatoes, cab-

bage and tomatoes are considered standard. It is largely used in flavoring soups and dressings, and is often cooked and served like asparagus. It is also extensively used in the fresh state and serves as the body of many popular salads.

Soil requirements are decidedly exacting, and commercial growing is confined very strictly to those regions where these conditions are best met. The muck or alluvial loam soils are always to be preferred. These are to be found usually in regions of reclaimed swamps. After the necessary clearing and draining have been done the soil should be broken and left exposed to winter conditions for at least one or two seasons before a crop is planted. This is necessary in order to bring about the proper aeration of the soil and to partially break down its wildness and coarseness. Heavy applications of lime are often desirable to correct the acid conditions of such soil and hasten the decomposing processes. The soil should be thoroughly broken and aerated to a considerable depth. The work of fining and smoothing such soils will be comparatively easy, as they are extremely loose and mellow, so much so that the horses' feet frequently must be fitted with broad shoes in order to keep them from miring down. While the soil areas best adapted to the growing of celery are naturally restricted, the question of climatic conditions is also of prime importance. A region of low humidity is usually to be preferred because of the development of fewer disease troubles under these conditions. An abundance of moisture must be available in the soil, however, and the water table should come comparatively near the surface.

The muck soils usually employed for celery grow-

ing contain much larger proportions of nitrogen than any of the other common elements of plant food, but liberal applications of potash and phosphorus are frequently made with splendid results. Top dressings of nitrate of soda may be made at intervals of two or three weeks in the early part of the season in order to stimulate rapid growth in the plants during their early development. Soft and pithy stalks are frequently attributed to the presence of too much nitrogen in the soil, especially toward the latter part of the growing season. Liberal applications of other elements are usually considered to produce firmer and more brittle stalks.

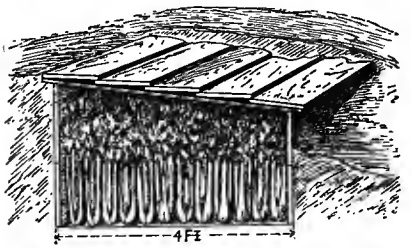
On account of the extreme small size of the celery seed, it must, as a rule, be started in the hotbeds or greenhouse where conditions of moisture and temperature can be well controlled. The seed is usually sown in flats or boxes and covered only very lightly, if at all. Not only the soil, but the air surrounding the boxes, should be kept very moist in order that proper germination may take place. The plants grow very slowly at first and should be transplanted once or twice before their final removal to the field. Should the plants become overgrown before time for transplanting they may be sheared back with excellent results. Transplanting is done almost entirely by hand. No machine has yet been perfected that will drop the plants sufficiently close together in the row.

Planting is done at various distances, depending upon the methods of cultivation and blanching to be employed. The common method is to set the plants at intervals of from six to eight inches apart, in double rows. There should be a distance of from six to eight inches between these, and

from three to 3½ feet between the double rows. The so-called new celery culture consists in setting the plants from six to eight inches apart in both directions in strips across the field from 6 to 10 feet wide. Walks or paths are left between the strips. After the growth is well started boards are placed around the outside. The crowding plants soon cause the leaf stalk to grow tall and the shading keeps them white. This method economizes space, but does not produce quite such high quality as where boards or earth are employed for blanching purposes. The common method found in some celery-growing sections is to lay the land off in strips about six feet wide, each alternate strip being planted to celery from six to eight inches apart in both directions. In the intervening strip some early maturing crop, as cucumbers, bunch onions or beets, are planted. These crops come off before the blanching process is started and the soil in these strips becomes available for this purpose. Both the wheel and horse cultivators are used in stirring the soil during the growing season. Wheel hoes are used extensively while the plants are small, even where the single-row method of planting is followed. Where two or more rows are planted close together the wheel hoes are used in the narrow spaces, while the wide spaces are cultivated with horse implements.

The value of celery depends directly upon the whiteness and brittleness of the stalk. This condition can be secured only by some method of blanching which eliminates the light and causes the green coloring matter to fade out, leaving the stalks white in color and greatly improved in quality. Blanching is done by the use of boards, paper, tile or earth.

The earlier crops are usually blanched by the use of boards. Planks from 10 to 12 inches wide are set up on either side of the rows and held in place by means of stakes and clips. Sufficient clips are used on the top edge to keep the planks from falling in too close to the plants. Paper and tile are rarely used in the larger fields, but may often be very successfully employed by the smaller gardeners, and especially in the home garden. After the plants have become well grown the stalks are gathered together and tied closely near the top and then wrapped with paper, or a four or five-inch tile is dropped down over the plant after it has been drawn together in the above fashion. Blanching with earth is more popular with the late varieties, and is generally considered to produce celery of greater brittleness and tenderness than any of the other methods. This method has the advantage of requiring little outlay for blanching materials, but does not permit of the soil being so well occupied as other methods. The earth is thrown up to the plants by means of special hilling tools, usually provided with guides for lifting the leaves in such a manner that the soil will push them together without being tied. Two or three hillings may be necessary to properly blanch a crop, as growth continues after hilling begins and the soil must be piled up higher in order to blanch the new growth.



A CHEAP AND SATISFACTORY CELERY STORAGE

Celery can be stored and held for a long period of time when proper conditions are provided. A cheap and satisfactory method of storing in the field may be described as follows: A trench from four to six feet wide and about the depth of the plants to be stored is dug of any length that may be required. The plants are now lifted from the rows and closely packed in this trench. A V-shaped roof is made from the blanching boards or from others by nailing them, overlapping each other in such a manner as to shed water. This roof is now placed over the pit and a furrow thrown over the lower edge along each side. One should provide for ventilaton at frequent intervals along the ridge of this covering. As cold weather comes on, the entire roof may be covered with a light layer of soil, over which is placed straw or corn fodder. If such a pit has been located on a well-drained spot and has not been covered too rapidly, celery will keep well and continue some growth under these conditions.

Celery for home use may be stored in the house cellar or in the outside storage cellar by boarding up one corner to about the height of the celery plants and packing the plants in tightly with soil. The celery may be moistened if necessary, but especial care should be taken to keep the temperature conditions uniform in order that condensation on the tops may not be induced by sudden changes. Great quantities of celery are packed in the crates in which they are to be marketed and stored in cold storage houses over the country. Celery usually keeps well under these conditions of low temperature, but loses its brittleness to a considerable extent.

The returns secured from celery are variable.

From $500 to $800 gross receipts is probably a fair average, with from $200 to $400 expenses per acre.

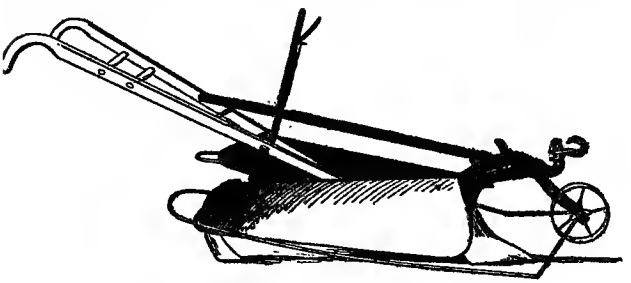
Several serious diseases are troublesome with celery. The celery blight is perhaps the most widely distributed and generally most prevalent. When attacked by this disease the leaves turn yellow, then brown and finally decay. This trouble usually begins its attack in the seed beds and is carried from there to the fields. It yields readily to treatment, but eternal watchfulness is the price of success. The young plants in the seed bed should be sprayed with bordeaux mixture every ten to fourteen days, and the treatment continued after being set in the field, especially when weather conditions are favorable for the development of the trouble. The spraying of the plants in the seed bed may be done with any of the common hand sprayers, but under field conditions the power sprayers must be employed. This trouble is more pronounced in the southern celery sections than in the northern. Serious outbreaks in the North are usually to be expected in extremely dry hot seasons.

Heart rot attacks the heart of the plant, usually during the blanching process and frequently causes large losses. Its presence may be noted by the offensive odors set up in the fields. Hot, moist, sultry weather soon after blanching has been started greatly favors the trouble. In the use of boards something may be done to check its development by widening the boards at the top, thus allowing freer circulation of the air about the plants. In no case should blanching be started during warm and rainy weather.

No insect enemies of serious importance are found attacking the celery. The zebra caterpillar

may sometimes be found in sufficient numbers to make handpicking advisable.

Varieties have been introduced in large numbers, but only a comparatively small list has ever succeeded in becoming popular in a commercial way. The varieties may be classed as white and green. The white group comprises all of the so-called self-blanching sorts which have come into common use only during comparatively recent years and have done much to revolutionize celery culture. The green sorts are of the larger growth and require more careful work in the matter of blanching.



A CELERY HILLER

White Plume, Golden Self-Blanching, Giant Pascal, Winter Queen and Boston Market are perhaps the leading varieties under cultivation at the present time.

Celeriac is a plant belonging to the celery family, but grown for its roots rather than leaf stems. It is used for flavoring and also for cooking purposes. It is not extensively grown in this country. It requires the same soil and cultural conditions as the celery and may be readily stored like all other root crops.

SWEET CORN

This crop is widely grown in both United States and Canada, and is available for use from early July until fall frosts. Sweet corn as a commercial vegetable is extensively grown in very few countries of the world, the United States leading them all in this respect. While it is largely used as a vegetable in the green form, its greatest use perhaps is for canning purposes. Sweet corn is adapted to a much wider range of climatic conditions than ordinary field corn, because the crop can often be sufficiently matured for table use in many regions where neither field nor sweet corn would mature for seed purposes. The soil requirements for sweet corn are practically the same as those for field corn and are not particularly exacting. A clay loam is perhaps the most desirable type, but the earlier varieties should always be planted on sandy soils. Late-maturing varieties should be planted on more retentive types. Sweet corn generally does better when planted on sod lands, but excellent crops are frequently grown on soils previously cultivated.

Fall plowing of sod lands is usually desirable, especially where earlier planting is to be done. The small, early maturing varieties may be planted much closer together than mid-season or late sorts. Drill planting generally gives better results than hill planting. Thirty inches will usually be a sufficient distance for the earlier varieties, while 36 to 40 inches should be given the larger sorts. One plant to every 10 inches with the smaller varieties, and every 12 or 15 inches with the large varieties, will perhaps be the more satisfactory distances in the row. For home gardens and under some conditions,

even for commercial purposes, corn may be started in paper pots in greenhouses or hotbeds and transplanted to field conditions. If the plants have been reasonably well hardened off before removal to the field much earlier crops can be secured in this way either for home or market purposes. The necessary cultivation for corn is generally pretty well understood. Frequent shallow stirrings should be the rule throughout the growing season, continuing up until the time of harvesting. Some varieties have a tendency to throw out large numbers of suckers, and these should be removed while still small, together with any surplus stalks.

Both the quantity and quality of sweet corn will be greatly increased with more liberal fertilizing than is common with field corn. From 10 to 15 tons of manure, supplemented by 500 to 800 pounds of high-grade fertilizer, usually proves a profitable investment.

The application of small quantities of nitrate of soda after the plants have become well established frequently results in a gain of several days in earliness.

It is important that the crop be harvested at exactly the right time in order to secure the maximum quality and highest prices in a commercial way. A point little appreciated is that sweet corn loses from 40 per cent to 60 per cent of its sugar content in from six to twelve hours after it is pulled from the stalk. This accounts for the very low quality of corn usually found in hotels and restaurants, and as a matter of fact in all corn bought upon the markets in the usual way, except where delivery is direct from the garden. The grains should be well filled, but yet in the milk or dough stage when

harvested. If pulled too early the sugar content has not reached its maximum and if pulled much later, while the sugar content is higher, the kernels have become tough and unsatisfactory.

Sweet corn is usually packed in ventilated barrels or hampers for shipping to distant markets. The low quality inevitably resulting when handled in this manner, makes it impossible to ship any distance with satisfaction, after local supplies become available.

Drying corn is a practice yet commonly followed in connection with many home gardens. This method of curing develops a dark color in the corn which is more or less undesirable, but the sugar content is much higher than that to be found in the canned product. A better understanding of home-canning methods has increased the amount of corn canned at home and to this extent has lessened the amount of dried produce to be found. Home canning gives every opportunity for the production of unusually high quality in the case of corn. As commonly handled through the commercial canneries the corn has lost much of its sweetness before it reaches the cans. Under home conditions the corn can be placed in the cans within a few hours after gathering, thus retaining all of its original sweetness.

The gross returns from an acre of sweet corn will be from $75 to $125. While this return is not particularly large, the cost of cultivation and marketing is correspondingly low, leaving a fair profit where plenty of land is available.

Insects and diseases are not particularly destructive to the sweet corn. The principal disease is the corn smut, which often breaks out on the ears, rem-

dering them unsalable and causing considerable loss. Rotation of crops and general sanitary measures, consisting of cutting out affected parts and burning them before the spores are shed, comprise the only satisfactory treatment.

The ear worm is the only insect of importance. This is a large larva usually entering the ear from the tip and eating its way about under the husk. While only a comparatively small portion of the ear is injured, the unsightly nature of the insect and its injury destroys all desire for the ears so attacked. This insect is more common toward the southern limit of sweet corn culture, but is to be dealt with from the Great Lakes southward and westward to the Pacific Coast. No effective remedies are known.

The most important varieties are Adams Early, in reality not a sweet corn, but an extremely hardy sort frequently planted for the first crop. White Cob Cory and Golden Bantam are widely planted early varieties of high quality. Cosmopolitan, Kendal's Giant, Country Gentleman and Stowell's Evergreen are varieties generally grown as a mid-season or late crop. Columbus Market is a variety grown extensively in the vicinity of Columbus, O., deserving of wider distribution. It is a mid-season sort with unusually large ears and broad, deep grains of high sugar content.

CRESS

Cress belongs to the mustard family and is used largely for salads, garnishes and as greens. There are three common forms sometimes found in cultivation, but the watercress is of much the greater commercial importance. The demand for this plant is constantly increasing, and it finds its chief use

during the winter months. Watercress is at home in springs and running brooks where the water is pure and clean. It will not thrive in muddy streams. In many locations small dams are built at frequent intervals in bends of the streams in order to slow the current and make conditions more favorable for development of this plant. Shallow canals are sometimes constructed in such a manner as to permit the water being turned into them and maintained at the desired levels. When canals are used for this plant it is a common practice to excavate and then fill in over the bottom to the depth of two or three inches with well-rotted compost. The seed is sown and the soil wet down only enough to secure germination. After the young plants are well started the water is turned in to a depth of two or three inches and gradually increased in depth as the plants grow larger.

Watercress is sometimes grown as a greenhouse crop directly in the soil. Any good greenhouse soil will answer the purpose provided it is kept somewhat wetter than is usual for most other plants. The crop may be easily established along banks of streams by sowing the seed or by sticking cuttings of the stems in the moist soil. Cress is harvested by wading into the water and cutting off the young tender tips of the stems and tying into bundles of convenient size. Under favorable conditions very profitable crops of this plant may be secured, as the cost of production is extremely low. The garden or pepper cress is an annual plant not in general cultivation in this country, but deserving of more consideration. It is especially valuable as an early and late salad plant, and grows well upon moist soils.

CUCUMBERS

The cucumber is among the oldest of cultivated plants, there being good evidence that it was of some importance several thousand years before Christ and one of the vegetables grown in the water-heated pits of the early Romans. As an outdoor crop, it is of more importance in the South than in the North. The cucumber ranks third in importance of all vegetables grown under glass. The plant requires hot and moist climatic conditions for its best development and thrives most luxuriantly upon sandy types of soils well supplied with organic matter and available plant food. It is extremely tender to frosts and for this reason is of more importance in the South, where it can be handled and started under field conditions with less difficulty than in the North. In cooler climates the cucumber must be grown as a midsummer crop, or if early fruits are to be secured the seed must be planted in greenhouses or hotbeds usually from the first to the tenth of March and be ready for transplanting to the field from the middle of May to the first of June.

The cucumber as a garden crop is cultivated for three distinct purposes, its general cultivation and care being greatly modified in each case. First as a field or outdoor crop for slicing purposes, second, as a forcing crop under glass for slicing purposes, and, third, as a field crop for pickles. Its cultivation in a commercial way under the first head is confined almost entirely to the more southern states. Where climatic conditions permit its growth with only slight protection, such as is afforded by cold frames and muslin-covered frames, it is cultivated almost the entire season through.

The preparation of the soil should be especially thorough. Deep plowing should be the rule, and the soil well compacted and fined to its full depth. Heavy applications of stable manures should be made, and it is a common practice in some localities to place a shovelful of well-rotted material in the bottom of each hill. Heavy applications of high-grade commercial fertilizers are used to supplement the stable manures. Some care need be taken to prevent a too rank growth of vine, which is sometimes secured by over-applications of nitrate, but this condition is unusual, just the opposite being much more likely to occur.

Under field conditions planting is usually done in hills from four to six feet apart in each direction. The rows should be checked in both directions in order to facilitate early cultivation. Planting should be delayed until the soil is thoroughly prepared and warmed. From 12 to 20 seeds should be planted in each hill in order to secure a good stand. After danger of insects have passed the plants in each hill should be thinned down to four or five. Almost constant cultivation with the horse implements should be kept up until the vines seriously interfere. Frequent hoeing about the base of the plants gives excellent results. Few crops respond to the use of the hand hoe better than the cucumber.

Harvesting is begun when the fruits are from five to 10 inches in length. They should be graded and sorted according to size, the larger and perfect specimens going into the first grade, while those of irregular size and shape may make up the second grade. Cucumbers are marketed in trays, boxes, hampers and sometimes in well-ventilated barrels. The cucumber is frequently grown as a companion

crop with a number of other garden vegetables. It is very common to plant the cucumber with lettuce and radishes. The planting is usually done about the time these crops are being harvested. They are sometimes started with early beets, carrots and various other plants. An excellent practice in the North is to follow the early peas with cucumbers for pickle purposes.

The growing of cucumbers under glass has come to be a very large and important industry in many sections of the country. Under the influence of field and forcing conditions, special types have been developed, commonly known as the English and American types.

The English type has been developed almost entirely under greenhouse conditions where the climate was such as to prevent their growth out of doors successfully. This type has never become popular in the United States and is rarely grown. The larger part of the cucumber crop in this country is grown out of doors, hence the development of what has been known as the field type.

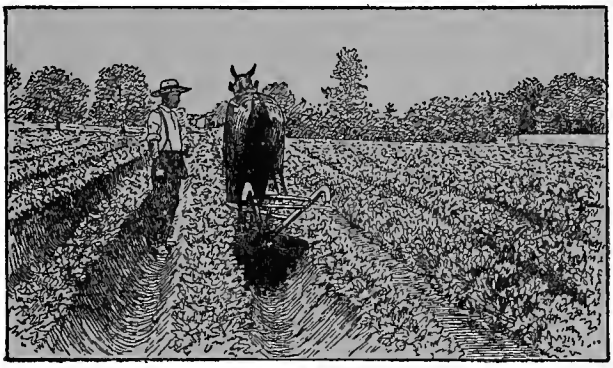
This type, however, gives splendid satisfaction under forcing conditions, and in this country is preferred to the English type. Soil conditions under glass are practically the same as that in the field. The chief difference, after all, is that moisture and temperature conditions are under almost perfect control, making it possible to grow these plants out of season and have them ready for market before it would be possible to even start them out of doors. The cucumber is usually grown as a succession crop after lettuce in the greenhouse. The latter crop requires low temperatures while the cucumber requires higher temperatures. After the warm days of late spring

and early summer come on, temperatures become too high for lettuce, but ideal for the cucumber. A change of crops should be made about this season of the year.

Growing cucumbers for pickles in many sections of the country is an extensive and important industry. On account of the fact that a definite market is known to be available beforehand it is not necessary that the crop be started unusually early. Planting may be delayed until out-of-door conditions are ideal for growth. It is important that the soil be highly fertilized and cultivated in order that a rank vigorous growth may be secured and a crop of high quality be produced. The cucumbers are picked for this purpose when from one-half to five inches in length, graded into various sizes and prepared for market in various ways. The grower usually sells his pickles by the pound or count, hence much higher prices must be secured for the smaller ones if they are to prove profitable. In case of cucumbers for pickling and table use it is highly important that all fruits be gathered before they become old enough to mature their seed. When this process starts a heavy drain is made upon the plant and new fruits usually cease to set.

Several serious pests attack the cucumber, often causing heavy losses. The striped cucumber beetle is the most serious insect, and is commonly found in every locality where this plant is grown. The insect lives over winter in the soil, and attacks the young, tender plants just as they come up through the ground. It sucks the juices from the plant, causing them to shrivel and die in a comparatively short time. After the second or third whorl of leaves make their appearance the plant seems to be too tough to be seriously damaged by this

insect. The insect is usually two-brooded. The very small, slender white larvæ are frequently found attacking the base of the stems during the summer. The adults again appear in the late autumn. A great variety of remedies has been tried and recommended for this insect, but none of them seems entirely satisfactory. Perhaps the most dependable methods of treatment at the present time are dusting with air-slaked lime and frequent spraying with



HILLING CELERY

bordeaux mixture and arsenate of lead. These remedies are, in a great measure, repellent rather than destructive. The writer has tried every remedy he has ever seen suggested, but has come to depend entirely upon spraying with bordeaux and arsenate to hold this pest in check.

An effective plan adapted to small areas is to make several plantings of seeds at intervals of three or four days. By dusting or spraying, the bugs can be kept off the first planting until the second one appears. The insects will of their own accord leave

the older plants for the younger and more tender ones. Another hill should be appearing by the time these are destroyed and possibly still another. By this time the plants in the first hill will have grown too large to be troubled by the insect.

The cucumber is troubled by three very destructive diseases—the mildew, blight and in some sections the wilt. Frequent spraying with bordeaux mixture, beginning as soon as the young plants are well through the soil and continued at intervals of ten days to two weeks up until almost harvesting time will usually be found effective in controlling all of these troubles. The power sprayer should be employed upon the larger fields and especial pains should be taken to hit the under as well as the upper sides of the leaves. Considerable added benefit has been frequently observed by not only spraying the whole plant thoroughly, but holding the nozzle close to the hill until perhaps a quart of the spray material has been directed around the stems well down into the soils. This kills the larvæ of the cucumber beetle frequently found feeding upon the base of the stem and serves the purpose of thorough disinfection, doubtless preventing the entrance of diseased germs at this point.

Many varieties of cucumbers are under cultivation, differing greatly in the size, shape and appearance of the fruit and their adaptability to certain particular uses. The most popular variety is the White Spine. This variety and its various strains are grown both in the field and under glass in this country more extensively than all other forms combined. Varieties especially valuable for pickling are Chicago, Boston and Fordhook Pickling. The several varieties of gherkin cucumbers are also extensively grown for pickling purposes.

DANDELION

The common dandelion is found so plentiful everywhere and is so universally used for greens that it hardly seems necessary to consider the cultivation of this particular plant. Nevertheless, the leaves of the wild plants are much inferior to those of cultivated forms which are becoming more and more popular every year. The dandelion is used primarily for greens and also for salads and garnishes. Deep, rich soils are necessary for rapid growth and the production of large succulent leaves.

Seeds are usually sown out of doors where the plants are to mature and after well started thinned to from six to ten inches. The rows are usually from 12 to 15 inches wide, the hand and wheel hoes being entirely depended upon for cultivation. It is a common practice to sow seed in the fall of the year. Dandelions are very readily grown in cold frames with only slight protection during the winter and will produce very profitable supplies of greens earlier than most other crops grown for this purpose.

The leaves are oftentimes blanched by tying them together with string or raffia, by mulching with straw in the fall of the year, or by covering with boards or earth. The first cutting is usually the best. The plant does best under cool conditions, and after hot weather comes more of the bitter principle develops in the leaves, making the crop less valuable for greens, salads, etc.

Frequent applications of nitrate of soda after the plants have become well established, promotes an extremely rapid, succulent growth of high quality. A number of distinct forms have been developed, differing widely in season of

maturity and the type and size of leaf. These forms, however, have not become sufficiently well fixed to make consideration of varieties particularly important.

No serious disease or insect pests attack the dandelion.

EGGPLANT

The eggplant is generally thought to be a native of India. In its wild state it is confined almost entirely to tropical and semi-tropical regions. With the greenhouse available for starting the plants, it is possible to successfully cultivate the eggplant during the warmer parts of the season much farther north than could otherwise be done. The commercial growing of the eggplant, however, is confined almost entirely to the southern states, but it is grown for home use and in a small way commercially in many northern gardens. The fruit of the eggplant is usually used in a green state, being sliced and fried in various ways. Its use begins when the fruit is from one-half to two-thirds grown and continues until the seed begins to harden. At this time the flesh becomes tough and loses its flavor. In the South where longer seasons are available, moist, loamy soils, abundantly supplied with plant food, seem to give the best results. In the North sandy soils of southern exposure are selected whenever possible and supplied with an abundance of stable and commercial manures in order to hasten the growth to maturity before frost comes.

Deep and thorough preparation of the soil should be the rule. The early plants started in the green-

house or hotbeds should be so handled as to receive no check in their growth before transplanting to the field. The eggplant requires much higher temperature than its close relative, the tomato, and cannot be safely transferred to field conditions in the North before June first. The distances for planting will vary somewhat with the varieties, but rows three feet wide with the plants two feet apart in the row, or rows four feet with the plants three feet apart in the row are common distances.

Cultivation should be continuous throughout the season in order to make available the large amounts of moisture necessary for good growth. Horse cultivation must be discontinued as soon as the fruits become large enough to be injured by these tools. Hand cultivation should be kept up considerably longer.

The eggplant is very easily handled and usually reaches the market with little loss. Care should be taken, however, to avoid bruising. Wrapping the fruit gives some added protection and can be made the means of profitable advertising.

The yields are always heavier in warmer sections and in hot summers. At best the results are uncertain under northern conditions, and the plant is grown only in limited areas.

Two common insect enemies attack the eggplant. The flea beetle often becomes very troublesome and the Colorado potato beetle likewise is serious. The latter insect seems to relish the foliage of the eggplant somewhat better than that of the potato. Bordeaux mixture for the flea beetle and arsenate of lead for the potato beetle will readily hold these pests in check.

The principal varieties of the eggplants commonly

grown are the Black Beauty, Long Purple and Black Pekin.

ENDIVE

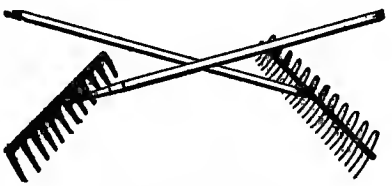
This plant is widely grown for European markets, but is just beginning to be appreciated in this country. It is not generally found in the home gardens, but deserves a place there because it supplies a long-felt want in the way of a salad plant for the fall and early winter season. It fills the same place in the fall of the year as lettuce does in the spring and is often called fall lettuce.

It is admirably adapted to use as garnishes, greens and salads. It is also frequently used, like parsley, in flavoring vegetables and meats. Its soil requirements are similar to those of the lettuce plant, growing best on sandy loams well supplied with organic matter and an abundance of available nitrogen. The value of the plant is greatly increased by blanching, which usually requires from 15 to 20 days. This is done in a variety of ways. The leaves may be gathered together and tied with raffia or string. The tied plants may be covered with flower pots or tile. Boards are frequently used and in many cases the plants are mulched with straw or leaves where it is desired to hold the plants until after severe weather comes on. It is quite hardy and will stand a considerable amount of freezing.

The plants are frequently dug with some soil adhering to the roots and closely packed in cellars or pits as already described for the celery. It is highly important that the heart of the plant be kept dry during the blanching process and that it be used as soon as sufficiently blanched, otherwise the leaves are very likely to decay.

HORSE RADISH

Horse radish has long been looked upon as an essential vegetable in every home garden. It is used chiefly as a condiment, but is also widely used in the home in flavoring various pickles and preserves. While its culture was formerly confined almost entirely to the home garden, it has become an important commercial product in a number of localities. While it will grow under almost any soil conditions, a well-defined type of root is necessary to meet market requirements, and this can be grown only on certain types of soil, somewhat limited in area. A deep, alluvial soil is always to be preferred. Muck soils grow tops at the expense of roots, while the heavy clay soils produce sprangly roots of little value commercially.



HAND GARDEN RAKES

The soil should be plowed from 10 to 12 inches deep and thoroughly fined all the way down in preparation for this crop. The plant produces no seed and is propagated in a commercial way from root cuttings. These cuttings consist of the side or lateral roots trimmed from the main root in preparing it for market. They generally range in length from four to six inches, the longest pieces producing the largest roots and consequently most valuable for cuttings. The top or large end of the pieces is cut square, after which they are tied in bundles of uniform size, packed in sand and stored in cool, moist cellars until wanted for planting. The pieces are sometimes buried in a well-drained soil out of doors.

The cuttings are usually planted perpendicularly in the soil with the top from three to five inches below the surface. Some growers, however, prefer to place the cuttings in an oblique or horizontal position. Furrows should first be made to receive the cuttings, which should be placed from 12 to 18 inches apart, with the rows from 30 to 36 inches wide.

Horse radish is frequently grown as a companion crop, especially with early potatoes. When grown in this way the cuttings are planted with a spade between the rows after the last cultivation. After the potatoes have been dug thorough cultivation should be given throughout the season. The most rapid and satisfactory growth will be secured during the cool weather of early fall. The plant is perfectly hardy and the roots may be left in the ground all winter without injury. Many growers dig and store only a portion of their crop in the fall of the year, and the remainder in the early spring. The roots dug in the fall are usually buried in the ground or stored in pits or cellars until sold.

From two to five tons of roots per acre are considered a good yield. The price fluctuates greatly, but in many seasons the above yield would prove extremely profitable.

No serious enemies attack the plant. The leading varieties are New Bohemian and Nuremberg.

KALE

Kale is a vegetable grown extensively in the southern truck garden sections and used entirely in the form of greens during the winter and early spring months. This plant is a non-heading variety

of the cabbage group. Cultivation of kale commercially is confined almost entirely to those regions where soil conditions are found ideal and close to bodies of water. These conditions are better met in the Norfolk and Long Island regions than in most others, and from these sections come practically all of the kale of commerce.

The soil and cultural requirements are similar to those required by the cabbage. Heavy fertilizing, both with stable manures and commercial fertilizer, will necessarily give the best results. Frequent applications of nitrate of soda during the growing season prove very beneficial.

Planting should be done in drills sufficiently wide to permit of horse cultivation, and the plants should be thinned from eight to 12 inches apart, depending upon varieties grown. Seeding should be done sufficiently early in the season to permit the plants to become well grown before winter comes on. Freezing improves the quality. It may be cut for market at various intervals or the entire field harvested at one time. It is usually packed for shipment in ventilated barrels or hampers.

Kale is a profitable crop in those districts adapted to it, but the demand is somewhat limited and the markets are easily overstocked. This plant deserves a wider trial in the ordinary home gardens, but little can be expected of it during extremely dry and hot seasons, except with irrigation.

The common cabbage insects and diseases are frequently found attacking the kale, but usually are not so troublesome as upon the cabbage.

The Scotch kales are more popular in the kale-growing districts of this country, Dwarf Green being the favorite variety. Other varieties some-

what extensively grown are the Dwarf German, Long Standing, Fall Green and Siberian.

KOHL-RABI

Kohl-rabi is another plant of the cabbage family, not generally grown and little appreciated in American gardens. This plant is often termed the turnip-rooted cabbage, the edible portion being the enlarged stem above the grounds, somewhat resembling a turnip in its general shape and character. In quality the kohl-rabi, when used in the proper condition, rivals cauliflower in its delicacy and deserves a much wider popularity than it now enjoys. It is one of the hardier members of the cabbage family and will stand a large amount of freezing without serious injury. It is, therefore, well adapted to both early and late planting.

KOHL-RABI

The cultural conditions required by this crop are the same as for cabbage. The plants are usually spaced from eight to 12 inches apart in rows sufficiently wide to allow of horse cultivation. The rows may be closer and hand cultivation entirely used if so desired. Quality depends largely upon quick and rapid growth, and the plants should be

harvested when the edible portion is from two to three inches in diameter. The larger, slower-grown specimens are very inferior in flavor and texture. In marketing, the plants are tied in bunches like early beets or sold in bulk, as desired. It is a profitable crop in the larger markets containing a considerable foreign population. It may be successfully stored in the same manner as already described for root crops.

LETTUCE

Lettuce is by far the most popular and widely cultivated of the salad plants. It is found growing everywhere in both commercial and home gardens as well as in the hotbeds and greenhouses. It can no longer be said to be a plant of any particular season, because even in the North it is grown as a field crop in the late spring and early fall and as a forcing crop under glass throughout the entire winter. Lettuce may be found for sale in almost every market of the country every month in the year. The crop requires cool weather for its best development, and this fact, together with its short season of growth, is largely responsible for its wide cultivation. It is by far the most extensively cultivated of all crops under glass.

There are three distinct types found in cultivation, viz., the head, loose leaf and the cos. The head lettuce is somewhat cabbage-like in its growth, the plant becoming close and compact and the central portions becoming well blanched, extremely brittle and high in flavor. The head lettuce is almost entirely grown for eastern markets and is in much greater demand every year. The loose leaf types

are much more commonly grown in the west and north. They are much less subject to diseases and insects and consequently much more easily and surely grown.

The cos lettuce is a type having long leaves with comparatively thick and heavy midribs and with a tendency to head loosely in such a way as to cause the inner portions to become well blanched. This variety is not in general cultivation in this country as yet, but its popularity is rapidly increasing, and larger and larger acreages are to be found every season.

Lettuce requires a rich, sandy loam for its best development. For the very early crops the sandier types of soils are usually preferred on account of their quickness. When grown in the fall the heavier types of soils, more retentive of moisture, are generally selected. An abundance of decaying organic matter is always essential and heavy applications of commercial fertilizer are always made by the most successful growers. Liberal use of nitrate of soda after the plants once become well established either indoor or out will give splendid results.

The seed may be sown out of doors under field conditions, or under glass, and the young plants transplanted to the field. For the early crops it is the common practice to sow seed under glass from 8 to 10 weeks before the time it is to be transplanted to the field. The seeding may be done in flats or directly in the beds. When the plants are two to three inches high they are "pricked" off into other locations from two to three inches apart in each direction. This intermediate transplanting produces strong, stocky plants that better withstand the removal to out-

of-door conditions. Plants are usually set from 6 to 10 inches apart in the rows and the rows from 12 to 15 inches apart, depending upon type and variety grown. Hand cultivation with the wheel hoes is depended upon almost entirely.

It is a good plan to heavily manure with well-rotted compost in the fall of the year and plow under, leaving the soil roughly ridged over winter. This will permit of quick drying out in the earlier spring, when the soil may be readily prepared for planting much earlier than otherwise would be the case. Lettuce may be transplanted to the open, when the plants have been properly handled, as soon as it is possible to prepare the soil. The plants will stand from 20 to 25 degrees below freezing without serious injury. A location comparatively free from weeds should be selected when possible in order to lessen the expense of cultivation and hand weeding.

Abundance of moisture should be supplied, for the value of the crop depends directly upon rapid growth. No crop will give better results with irrigation than lettuce. Crops should be ready for harvesting from five to seven weeks after started in the open. It is cut and packed in baskets, hampers and ventilated barrels. The type grown and the market supplied will largely determine the type of package to be used.

The lettuce is troubled with two or three serious enemies, the most common and persistent of which is the green aphis. This pest is much more destructive under greenhouse conditions than in the field. It is a sucking insect and can be destroyed most readily by the use of tobacco in some of its various forms. The common treatment in the greenhouse is to burn quantities of tobacco stems or vaporize

some of the commercial tobacco extracts throughout the house. A light treatment two or three days in succession at intervals of ten days is usually considered the best method of control. This will be much more effective in destroying the insects present than one strong treatment and be much less likely to injure the plants.

The mildew is the most common disease. It may be recognized by the plants affected showing areas of slightly yellowish color, which later become darker and finally die. In the last stages of the disease the tissues of the leaves become covered with a moldlike substance which is the reproductive portion of the mildew. All plants showing signs of the trouble should be removed and destroyed.

Watering should be done in such a way as to prevent wetting the leaves, and be confined entirely to mornings of bright days. This trouble is much less common under field conditions than it is in the greenhouse.

The lettuce rot or drop is specially destructive to frame and greenhouse crops and in many cases attacks the head lettuce out of doors. It develops most rapidly under moist, warm conditions, and a few days of rainy, warm weather at the time when the head lettuce is beginning to head may destroy the entire crop in a very short time. The first indication of the trouble is a slight wilting of the plant during the daytime, from which it seems to recover at night. Decay quickly sets in, however, accompanied by offensive odors. Little can be done for this trouble under field conditions except to cut and destroy the diseased plants as rapidly as they appear. All stable manures should be thoroughly well rotted before applying to the soil in

regions where this trouble is common. Rotation of crops should likewise be practiced. Dusting the plants as well as the soil with flowers of sulphur from time to time will often be found helpful in keeping this trouble in check.

Lettuce is usually a profitable crop when well grown under any conditions. When grown as the main crop by itself not less than 30,000 heads should be secured from an acre. Gross returns of $1,000 per acre or more are not uncommon. This crop is usually grown as a companion or succession crop in connection with other vegetables in the northern gardens. It meets these requirements unusually well and for this reason is extremely satisfactory and every year finds its place as a part of the general garden plan.

Varieties are numerous, but of the head type Hanson and Big Boston are the most widely planted. Of the loose leaf types the Grand Rapids and Black Seed Simpson are the most popular. Of the cos type the Express, Paris White and Bath are most commonly grown.

MUSKMELON

The muskmelon is more widely grown in this country than any other. Thousands of acres of this crop are grown in the United States annually, yet its total commercial importance is not so great as that of the cucumber or the watermelon. The extent to which it has become esteemed as a dessert fruit during the last ten or fifteen years has greatly increased its importance and certain restricted areas have come to be known as producing melons of exceptionally high quality.

Certain sections of California and the Rocky Ford district in Colorado are known the country over as

producing cantaloupes of exceptionally high quality, while southern Indiana and various sections of New Jersey, Maryland and Georgia are likewise famous for the production of this crop.

The soil requirements for the muskmelon are of less importance than climatic conditions. This plant is extremely tender to frost and is often seriously injured by cool weather. A comparatively long, hot season is required for its best development. The most desirable soils are the looser types of clay loams, heavily enriched with compost. The sandier types of soils are frequently preferred on account of their earliness, and the greater part of the large acreages will be found upon sandy soils primarily for this reason. The heavier clays, especially when improved by heavy applications of stable manures, also give splendid results. The soil should be plowed as early as possible and frequently harrowed until planting time, in order to conserve the moisture and destroy the weeds.

The securing of good seed is of the greatest importance in connection with this crop. The common practice of utilizing the culls as a source of seed after the marketable crop has been gathered accounts for an enormous amount of the inferior seed placed upon the market. The resulting vigor of the plant, its productiveness and quality, together with disease-resisting characters, depend directly upon the intelligence exercised in seed selection. Many growers select and save their own seed. This plan proves satisfactory if done with intelligence and if especial care is taken to consider the plant as a whole in making selections. Only the best fruits should be saved for seed and from plants especially selected for the purpose.

Planting should not be done until weather and soil conditions are favorable. The seed is planted either in hills or drills. Formerly the hill method was universally followed, but during the last few years the drill method seems to be gaining in popularity. When planted in hills these should be made from five to six feet apart in each direction. When planted in drills the rows should be from five to six feet apart and the plants from 12 to 18 inches apart in the rows. Abundance of seed should be used by either method in order to secure a good stand. Surplus plants should be removed by subsequent thinning after dangers from frost and striped beetles are past.

Double planting is followed by many growers in order to make a good stand still more certain. The second planting is made a few days after the first, and sometimes even a third a few days after the second. If frosts or insects should destroy the earlier plantings, the later ones will take their place without serious loss of time. While the bulk of the field crop is grown by direct seeding, many growers start their plants under glass, transplanting to the field as soon as weather conditions will permit. This gives earlier crops and in many locations proves a very profitable practice. The seeds are planted in greenhouse or hotbeds, in small flower pots, berry boxes, paper pots or inverted sods about four weeks before they could be planted out of doors. A well-prepared compost should be used for filling the boxes and pots for this purpose. If sod is to be used, it should be cut from a sandy or loamy soil. Special care should be given to watering and ventilation in order that rapid growth may be secured without check and the plants should be thoroughly

well hardened before removing to field conditions. When this plan is carefully carried out in every detail, splendid results are secured, but all too often carelessness in handling and hardening results in some check from which the plants never recover, under which conditions direct field planting will prove much more satisfactory.

The muskmelon requires large amounts of organic matter in the soil, and for this reason stable manures universally prove the more satisfactory forms of fertilizer. New soils generally give the best results with this crop, but, of course, are rarely available and must be considered as only an incident in their cultivation.

A common practice is to remove the soil to a depth of six or eight inches at a point where the hill is to be located, and place a good shovelful of well rotted compost in the bottom of the hill. The manure should be compacted thoroughly and covered with three or four inches of soil in which the seed is planted. Liberal applications of high-grade commercial fertilizer analyzing approximately 4-8-10 should be applied at the rate of from 500 to 1,000 pounds per acre in addition. Many growers follow the plan of distributing this entire amount over the land before the melons are planted. Others distribute a part of it before planting and the remainder around the hills after the plants have become well established. Earlier growth is especially important in successful cantaloupe culture. This is often greatly increased by applications of nitrate of soda around the plants after the roots have become sufficiently developed to take it up readily.

Cultivation should begin as soon as the plants are through the soil and in many cases even before.

Should rains occur soon after the seeds have been planted the crust should be broken by the use of a rake or small hand tool of some kind. This is important in securing the proper germination of seed, but must be done with care after germination has well started, on account of the danger of injuring the developing stem. Horse cultivation must be frequent and shallow throughout the entire season until impossible to get over the land on account of the running vines. Many growers go to the trouble of laying the vines aside in one direction in order to secure an extra cultivation or two. Frequent hoeings should be given as long as the vines will permit.

When available markets are close at hand, melons should not be harvested until approximately ripe. This will be indicated in most varieties by a cracking or loosening of the stem from the fruit, and the characteristic grayish or yellowish colors should be well pronounced. Where shipments must be made to distant markets, picking must be done earlier, but it is always at the expense of quality. This is the point on which the local grower is able to successfully compete with the growers of special sections where conditions are generally considered to be much more favorable.

Melons are handled in various ways, depending upon requirements of market and distance from the same. When the market is within hauling distance, they may be easier and more readily marketed in bulk from the gardener's wagons. For more distant markets hampers and bushel baskets are very satisfactory. The bulk of the crop from the special melon-growing sections is packed in crates usually holding forty-five melons of standard grade. Some

sections use the climax baskets for the smaller types of melons. The shallow crate holding only one layer (usually 10 to 15 melons) is also used in many places.

Yields vary greatly, but from 100 to 300 crates or from $200 to $500 gross income per acre will generally be considered good returns. The melon admirably lends itself to forcing conditions, but while this crop has been grown to a considerable extent in the greenhouses and conservatories of country estates it has not become generally grown under glass for commercial purposes. When people come to better understanding and appreciate the quality of the fruit grown under forcing conditions, the larger markets will afford a splendid demand for this crop. It can be made to take the place of cucumbers under glass after lettuce, in a very satisfactory manner, and if demand could be stimulated sufficiently to justify its growth it would become valuable to the greenhouse manager in helping him to solve one of his most serious problems, namely, diversity of crops.

Insects and diseases are frequently serious and in many locations have practically eliminated the profitable culture of the melon. The striped cucumber beetle seems to be especially destructive upon the cantaloupe. It may be controlled by the methods described in connection with the cucumber.

The mildew and wilt are generally more serious on the melon than the cucumber, frequently causing very heavy losses. The wilt is particularly destructive and remains in the soil from year to year. Rotation of crop is the only effective method of control. This disease not only causes the destruction of the plants any time after they appear

above ground until harvesting time, but they frequently succumb after the melons have become well formed, which causes them to ripen prematurely and without flavor and quality. The great prevalence of this disease, resulting in melons of low quality, has been responsible for a very great decline in consumption.

Blight likewise is a serious pest. These diseases may be well controlled by frequent sprayings with bordeaux mixture at intervals of 10 days or two weeks from the time the plants are well above ground until it is no longer possible to get through the vines.

MUSTARD

Mustard is a member of the cabbage family, cultivated to some extent in home gardens, but not found to any great extent in the commercial gardens of the country. Its chief use is in the form of greens, and its popularity for this purpose seems to be on the increase. Many people like the "bitey" taste of this plant, and on account of the extreme ease with which it can be grown it should become increasingly popular with the gardener. It is also used to a considerable extent as a salad plant, and in some localities is grown and matured for its seed, which is largely used in making the ground mustard and oil of mustard of commerce. The seed may be sown any time from early spring until late fall. It is a common practice to sow early in the spring for the summer crop, about July or August for the fall crop, and September 1 to October 1 for the early spring crop.

Several varieties are now offered on the market. The White London, Southern Giant and Chinese are the principal ones grown.

ONION

The onion is one of the oldest plants in cultivation, and because of its great adaptation to a wide range of cultural methods and the endless uses to which it may be put, its growth is almost universal and in some localities it is grown in very large areas. The plant belongs to the lily family and contains a number of important subdivisions, each of considerable importance commercially, and meeting variable uses. The first class comprises all of those varieties commonly produced directly from seed. This class includes practically all the main crop as grown in the North. A second class reproduces itself from compound bulbs which contain a great number of growing points, each of which develops into a like bulb. This is commonly known as the multiplier group. The potato onion belonging to this group is largely planted in the fall of the year on account of its extreme hardiness. It requires only that it be mulched to pass the winter in perfect safety, even under northern conditions. From this division is secured a large part of the early bunch onions grown in the North. A third class is known as the Egyptian or tree onion. This onion produces a stock corresponding to the blossom stock in common forms, but develops small bulbs on the top instead of flowers and seeds. This group is extremely hardy, withstanding northern winters successfully without protection of any kind. They are usually planted in the fall of the year. They make some growth before cold weather comes and start growing very early in the spring. They furnish a large share of the extra early or green onions of the market.

Onion sets may be considered as a subdivision of

the first group, because produced directly from seed. They are simply normal onions that have been arrested in their growth and development by methods of planting and cultivation. When replaced in the soil this arrested growth continues and matures large bulbs. The onion set is also used largely for the production of early bunch onions.

Ideal soils for the onion seem to be muck or alluvial lands, found in restricted areas in a great many places over the country. While the onion may be grown in almost any type of soil, except the heaviest clays, the cost of cultivation is materially lessened and yields usually increased by planting in the so-called muck soils, universally considered as typical for this particular crop. Loamy soils, however, frequently produce firmer and heavier bulbs of better quality than those produced in muck soils. The cost of production, however, in connection with other factors usually throws the value in favor of muck soils. Thorough preparation should always precede the planting of onions. If the muck or swamp soil has grown no former crops it is always the better plan to clear and drain, then plow in the fall and grow one or two crops of corn, potatoes or something of the kind in order that the wildness may be largely worked out and decomposition well started before risking onions. If large quantities of undecayed organic material are present the soil will

A GOOD BUNCH OF SPRING ONIONS

usually be acid. This condition can be corrected by liberal applications of lime. Stable manures are absolutely essential in the production of satisfactory crops from any type of soil except the muck, and even in these soils stable manures are frequently considered the most desirable form of fertilizer. Liberal applications of from 500 to 1,000 pounds per acre of commercial fertilizer analyzing approximately 4-8-10 are frequently made with profitable results. The onion is a gross feeder, the total number of plants per acre is enormous, and as a consequence, satisfactory results cannot be expected except there be a large amount of plant food available and an abundance of moisture present to carry it to the plants. Fall plowing should be practiced whenever possible, especially when manures are applied. In the spring the soils should be fined and pulverized by the frequent use of the disk, spring-tooth, smoothing and Meeker harrows, the surface finally being left perfectly smooth by the use of the drag.

The seed of the onion retains its vitality for a very short period of time and should never be depended upon for commercial planting after the first season. Every precaution should be taken to secure the best seed possible. A few seedsmen have established a reputation in connection with the onion seed they supply. Every effort should be made to get in touch with such dealers. Poor stands and consequently heavy losses are of all too common occurrence as a result of poor and cheap seed.

Seeding is usually done with any of the excellent hand drills now upon the market. The rows are drilled from 12 to 18 inches apart. From three-quarters of an inch to one inch is the proper depth for

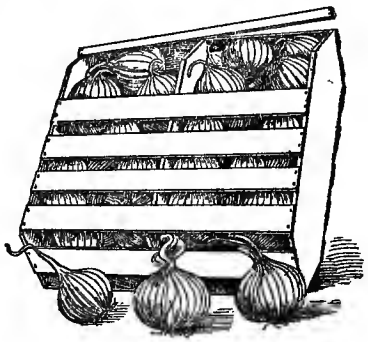
planting. After the plants are well established they are thinned by hand, leaving the plants from one to two inches apart in the drills. Thinning is extremely tedious and an expensive process, and most of the successful growers eliminate this matter by thorough testing of the seed before planting and adjusting the amount of the seed sown in order that no thinning may be necessary. From four to six pounds of seed are usually required to plant an acre at the ordinary distances. Cultivation is done almost entirely by means of the wheel hoes. The ideal attachments in muck soils are the scrapers or knives which cut just beneath the surface of the soil. In the heavier soils some of the tooth attachments will probably give better satisfaction. In some cases a small-footed horse or mule may be trained to satisfactorily follow the rows when 18 inches wide. Some hand weeding will always be necessary, and it is highly important that this work be done before the weeds become of any considerable size. Otherwise a large amount of injury will result by loosening and lifting the onion plants as the weeds are removed. The onion crop usually matures from the middle to latter part of August and is ready for harvesting when the tops begin to brown and three-fourths or more have fallen over on the ground. Harvesting is done by attaching a U-shaped knife to the ordinary two-wheeled hand hoe, straddling the row and allowing the knife to run underneath the plants, cutting off the roots and at the same time slightly lifting the bulbs. The onions are then gathered by hand and thrown into windrows containing from four to six rows. They should be left exposed to the sun and

air for several days and stirred occasionally with a wooden fork or rake to facilitate drying.

White bulb varieties must be gathered immediately in slat crates and placed under cover where they will be protected from sun and rain, but exposed to a free circulation of air. After being thoroughly aired the tops are removed by twisting or clipping with the ordinary sheep shears. Twisting is usually to be preferred and is not so likely to be the cause of the soft or neck rot finding its way into the bulb. Onions are generally stored in frostproof houses in slat crates. They are sometimes spread to the depth of three or four inches on trays, or placed in bags. Crates are considered, however, much more satisfactory, because they occupy the space to better advantage and afford a much freer circulation of air. An abundance of ventilation must be provided, both at bottom and top of storage, in such a manner that a thorough circulation of air is assured. The bottom inlets are frequently carried well toward the center of the building in order that cold air may be carried directly to that part of the storage most likely to need it. The best temperature for storage is usually considered to be from 34°to 36°. Dryness is an important factor to be remembered. In the far northern regions where continuous freezing is the rule throughout the winter, the onions are sometimes stored in such a manner that they become thoroughly frozen, but are protected from thawing out until spring. Frequent freezing and thawing would, of course, be destructive.

Under field conditions in the South a different type of onion is grown, known as the Spanish or Bermuda. This onion is larger in size, milder

in flavor and requires a longer season for its development than the ordinary field onions grown in the North. This type is successfully grown in the North, however, by sowing the seed under glass from four to six weeks before it would be possible to sow out of doors. The seed is sown in drills three to four inches apart and quite thickly in the rows. When the plants become five or six inches high they are sheared back to about four inches. This shearing is repeated two or three times in order to produce stocky plants and facilitate transplanting. When danger of frost has passed and the soil has been properly prepared, these plants are lifted, the roots trimmed, and transplanted to the field in rows 12 to 15 inches wide and from three to four inches in the rows. These distances require approximately 170,000 plants per acre. While the cost of growing the plants and transplanting is, of course, considerable, the work of thinning is entirely eliminated and a much more uniform set of plants will be secured, resulting in much heavier yields than are common from direct seed sowing. Authentic reports are on record of 1,000 bushels per acre being produced in this way.



BERMUDA ONIONS AND CRATE COMMONLY USED

These onions are harvested in much the same way as already described for the common type, but they

are marketed at once, and cannot be stored like the common onion.

The growing of onion sets, while adapted to all soils and locations in which the common onions may be grown successfully, is restricted to a very few localities. Most of the onion sets come from certain sections of California, Kentucky and Ohio. The sandy or loamy types of soils are usually preferred. After thorough preparation and fertilizing, as already described for the main crop, the seed is planted at the rate of 40 to 60 pounds per acre, instead of from four to six. The seed is spread or scattered over a strip two or three inches wide by the use of a spreader attached to the planter. These plants remain small on account of their extremely crowded condition and begin to "bottom" by midsummer. They are usually harvested before they become thoroughly mature, for the reason that by so doing the tendency to produce seed stocks the following year is greatly lessened. The U-shaped cutter attached to the wheel hoe is commonly used in harvesting. This knife is run under the plants, cutting off most of the roots. The bulbs are then pulled and thrown into windrows by hand. They are usually allowed to remain in the open until partially cured, after which they are taken to sheds, where the curing is completed and the tops removed. They are then placed on trays in layers from four to six inches deep and left until ready for market. The bulbs are usually handled in bags or barrels, the latter being most satisfactory on account of the lessened injury resulting from the necessary handling.

The value of the onion sets depends inversely upon their size. If the sets are permitted to grow

too large they at once throw up seed stocks the following season, instead of developing into a large bulb. A good set should be one-half inch or less in diameter.

Pickling is another way in which a large quantity of onions are used. When grown for this purpose special methods of cultivation and harvesting are required. From 25 to 30 pounds of seed are usually planted per acre. Cultivation and harvesting are practically the same as described for the growing of onion sets. The bulbs for pickling purposes must be remarkably uniform in size and from one-half to three-quarters of an inch in diameter. Bulbs less than one-half inch may be screened out and sold for sets, while those larger may be sold for pickling.

The use of onion sets in the production of green or bunch onions in the spring and early summer has many advantages over the seed. They can be placed in the soil as early as weather conditions will permit of its proper preparation. They at once start into rapid growth and produce a salable product within a short time. Quick returns are secured and the land may be prepared for other crops. Farmers' Bulletin 354, United States Department of Agriculture, gives the following instructions as to storing onions:

"In order that onions should keep well when stored they must be well ripened and thoroughly cured. Those that are immature, soft or 'thick necks' should never be placed in storage, but sold as soon as gathered for whatever price they will bring. Good storage onions will rattle almost like blocks of wood when poured from one crate to another. In order that the bulbs may remain bright and of

attractive appearance they should not be allowed to lie exposed to the weather, but should be hauled and stored in open sheds just as soon as they may be safely placed in one-bushel crates.

"After the bulbs have remained in drying sheds or cribs for several weeks they will be ready for screening and removal to the storehouse. In handling onions it is the rule to pass them over a screen each time they are moved, as in this way the loose skins are removed and any soft or decaying bulbs may be sorted out.

"In screening, the onions are placed on one end of the screen while the men stand alongside and stir the bulbs about with their hands, passing them along to the opposite end, where the bags are filled.

"The essentials for the successful storage of onions are plenty of ventilation, small quantities together, a comparatively low temperature, dryness and safety from actual freezing. Any building wherein the above conditions may be secured will answer, but houses built especially for the purpose are most satisfactory.

"The construction of the storage house should be double throughout, with plenty of felt or paper lining. Both top and bottom ventilation should be provided and the ventilator openings should have doors that may be closed or opened at will. The floors should be constructed of narrow planks with half-inch spaces between the planks for the passage of air. Bottom ventilation is frequently secured by means of drain pipes built into the foundation at the surface of the ground. These pipes are carried some distance toward the center of the house and discharge the cool air at a point where it is most needed.

"The temperature of the storage house should be carried as low as possible without freezing. During extremely cold weather the ventilator openings and doors should be kept closed to keep out cold, and after the onions have become thoroughly chilled the house should be kept closed in order to hold the temperature down and prevent the entrance of moisture during warm or rainy periods. Damp, foggy weather is injurious to onions, especially if it follows a period of cold, as the bulbs will become covered with condensed moisture if the outside air is admitted. A little artificial heat from a stove or radiator may be required during excessively cold weather, but so long as the temperature in the house does not fall below 33° there will be no danger of injury. A temperature of from 34° to 36° will give best results.

"The best receptacle for storing onions is the standard size slat crates 20 inches long, 16 inches wide and 14 inches deep, outside measurements. The material for the sides and bottom is about three-eighths of an inch thick and 2½ inches wide, four pieces being used to form a side. The corners are reinforced on the inside by means of three-cornered pieces of oak, to which the slats are nailed. These dimensions provide crates that are interchangeable, the width of five being equal to the length of four. These crates will also nest together when empty, with one inside of two turned together. The full crates are stacked in the storehouse with one by three-inch strips between them to allow for the circulation of air.

"Onions are sometimes stored in slat bins holding 100 to 300 bushels each. Bags are also used to some extent, but neither bags nor bins are as satis-

factory as the crates, owing to the difficulty in providing the necessary ventilation and change of air through the onions. Bulbs stored in bags or bins must be more thoroughly cured than those stored in crates."

Potato onions are very largely used in many sections in producing bunch onions for spring use. They are set in the soil in early September and make some growth during the fall of the year. After severe weather comes a mulch of two or three inches of straw should be placed over them. With the first approach of spring they start into growth and produce onions ready for bunching in a very short time.

The yields and profits from the onion are, of course, variable, but from the very nature of the crop it permits of intensive cultivation, and under proper soil conditions and good care yields large returns. From 200 to 400 bushels per acre should be secured on the average under good conditions and with good care. Much higher yields are frequently secured, but are the exception rather than the rule.

The onion is often seriously injured by insects and diseases, as might be expected from the intense nature of its cultivation and the lack of proper rotation usually found in common practice.

The onion maggot is the most serious insect pest. The eggs are deposited on the plants near the ground soon after growth is well under way. These eggs hatch in a week or ten days, the larvæ burrow their way into the bulb, where they feed for two or three weeks and then pass into the pupa form. Another generation soon makes its appearance to continue the life cycle. Injured plants turn

yellow, and die before the bulb matures, or if practically matured before injury occurs the way is paved for rot and decay to enter the bulb and in this way cause serious loss. Rotation of crops is the only effective measure of control. The liberal fertilizing of the soils with potash fertilizers has sometimes been found to be helpful in controlling this pest by stimulating a more rapid and vigorous growth, in some cases enabling the bulbs to successfully outgrow and overgrow the damage. Carbolic acid emulsion has been found to be partially effective against the pest. This material is made by dissolving one pound of any kind of soap in one gallon of water and adding one pint of crude carbolic acid. This mixture is thoroughly stirred into the form of an emulsion. One pint is diluted with 30 quarts of water and poured around the base of the plants. While this treatment has proved effective, it is out of the question over large areas.

Onion thrips is a destructive insect pest, especially in the Bermuda onion-growing sections, and is frequently found in the northern growing sections as well. This insect is extremely small and is provided with sucking mouth parts. The insect causes the appearance of minute white spots which rapidly turn brown, and if abundant cause the leaves and the entire plant to die. Spraying with kerosene emulsion is an effective and practical remedy. Bordeaux mixture also serves as a repellent and is perhaps of considerable value in adding to the control of certain disease troubles.

Onion smut is a widespread disease, apparently becoming more and more prevalent and destructive each year. This disease attacks the young plants, causing the formation of dark spots or lines on the

bulb. As the onion develops these spots open, exposing the dark powdery spores of the fungus. The tops wither and die, frequently followed by a withering and drying of the bulbs. Good field sanitation affords the only satisfactory control of this trouble. All the refuse from the field should be carefully gathered and burned after the crop has been harvested. A strict system of rotation should be followed, allowing three or four years to intervene between crops. The transplanting method largely avoids this difficulty if the seedlings are kept clean before transplanting is done.

The experiment stations of Connecticut and New York have demonstrated that lime and sulphur in equal parts sown in the drill with the seed largely reduced the trouble. At the Ohio station a formaldehyde drip, made at the rate of one pound of formaldehyde to 30 gallons of water, applied to the seed and soil at planting time by means of a drip attachment to the seed drill, and using about 150 gallons of the solution per acre, was likewise effective in controlling this trouble.

The heart rot is a bacterial trouble attacking all types of onions and usually appears in storage. It seems to be largely caused by careless and rough handling in topping and storing. All implements used in this work should be frequently and thoroughly disinfected. The spread of the trouble in storage may be prevented by fumigation with formaldehyde gas.

Danvers is the yellow variety most largely grown. Southport Yellow Globe is also popular in many sections. Wethersfield is a popular red onion, shipping and handling especially well. Red sorts are in better demand in markets of the middle west than in other

sections of the country. Southport Red Globe is also a favorite in many sections where red onions are grown. White Portugal, Southport White Globe and Silver King are the principal white varieties grown under field conditions. White Queen and White Barletta are largely grown for pickling purposes. Both white and yellow sorts of potato onions are planted extensively for the purpose of growing bunch onions. The Egyptian or perennial onion is an extremely hardy variety, valuable for fall planting in the North for the production of bunching onions. The varieties of the Bermuda or Spanish type of onions grown in the southern parts of the United States, principally in California, Louisiana and Texas, are Prize Taker, Gibraltar, Red and White Bermuda.

PARSLEY

Parsley is of limited importance as a vegetable crop in the United States. It is used almost entirely for garnishing purposes, but it is sometimes used as a salad and also for flavoring soups and meats. The plant is very hardy, especially when mulched, often withstanding winter conditions, even in the North. It requires moist, fertile soil for its best development. The seed germinates slowly, and for this reason it is usually started under greenhouse or hotbed conditions and transplanted to the fields. The plants are permitted to stand from six to eight inches apart in rows from 12 to 15 inches wide. For a fall crop sowing should be done the latter part of May or first of June in the North. For the spring crop seed should be sown in the greenhouse and the young plants ready to be removed to the soil as soon as weather conditions will permit. In

growing a small amount for home use this plant may be made to serve the purpose of an ornamental plant and at the same time produce an abundant supply of the curled and attractive leaves for garnishing and flavoring purposes. A few plants grown in six or eight-inch pots filled with good soil will be ample to meet the above requirement.

The varieties of parsley commonly grown are the Extra Curled Dwarf, and the Moss Curled. The more curled and finely cut the leaves, the more valuable the parsley is usually considered to be.

PARSNIP

The parsnip is an important root crop extensively cultivated in the home gardens of the North and grown to a limited extent by most market gardeners. It is not cultivated in an important way by the large truck gardeners of the country. The parsnip is particularly well adapted to northern conditions. A long growing season is secured by the plant's extreme hardiness with reference to frosts, the latter being essential to the development of the highest quality. Its uses are comparatively few, thus restricting the demand for the crop.

Deep, fertile, sandy loams are usually considered to grow the finest roots. On account of the long roots the parsnip requires deep soil. Heavy clay soils have a tendency to produce crooked and forked roots of little commercial value. The seed germinates slowly and the young plants make a weak growth until they become well established. For these reasons special care should be taken in the preparation of the soil and the early cultivation. A deep seed bed should be insured by deep plowing and thorough disking. The surface preparation should be completed with

the use of the spring-tooth and smoothing harrows, followed by the Meeker harrow or plank drag.

The seed should be planted about one inch deep in rows from 15 to 30 inches wide, depending upon the method of cultivation to be followed. The young plants should stand from three to four inches apart in the rows. Planting should be done as early in the season as the proper preparation of the soil can take place. Thorough cultivation should be given throughout the growing period in order that moisture may be conserved and weeds destroyed. The young roots are frequently harvested in September and October, but they lack the high flavor so characteristic of this vegetable later in the season. The quality of the parsnip is generally considered to be greatly improved by freezing. The main crop is usually dug in the fall of the year after some freezing has occurred and stored in pits or cellars or buried out of doors in the soil, as already described for root crops. A part of the crop is frequently left in the soil and dug the following spring after the frost comes out of the ground. The chief thing to be remembered in storage is to prevent shriveling and to keep the temperature low enough to avoid any growth.

No serious insect or disease pest is found attacking this plant.

The Guernsey and Hollow Crown are the two varieties planted most extensively.

PEA

The pea is one of the oldest of cultivated plants and is of European or Asiatic origin. A large number of species are to be found, but the common garden pea is by far the most important. It is used

in a great variety of ways and its food value ranks very high. It likewise plays an important part in the necessary crop rotation schemes of the gardener on account of the fact that it belongs to the leguminous group of plants, now known to have the power of fixing the free nitrogen of the air in a form available for plant growth and thereby of great value to all cultivators of the soil.

The pea is classified in various ways, but perhaps the most important grouping is that depending upon the nature of the seed. From this standpoint the pea is divided into three groups or types. First, including all those varieties with smooth, hard seed; second, those with green and wrinkled seeds; and, third, those with thick fleshy pods and small seeds. The latter are cooked and used in the same way as string beans.

The first group includes most of the extra early varieties. They excel in hardiness and are very resistant to frosts. This group comprises a number of the most important commercial varieties. The second or wrinkled group is less hardy, more likely to be injured by frosts and is not well adapted to field conditions. Its cultivation is confined almost entirely to home and market gardens. The third group, or sweet peas, is grown only in a limited way and is adapted only to garden culture. Peas are also classified as dwarf, half dwarf and tall, depending upon their habits of growth. They are likewise classified into early, medium and late varieties, depending upon their time of maturity. This classification is carried through the other groups.

Peas are especially well adapted to the cool days of spring. This fact, together with the comparatively short season required to mature them to a

proper state for use, accounts for their successful cultivation over a wide range of latitude. The soils best adapted to the cultivation of the pea are the well-drained clay loams. These soils are retentive of moisture and are cool in their character. When grown as an early crop, especially in the South, the more sandy loams are usually preferred on account of the earlier preparation possible and the quicker results secured. While the soils for peas should be rich in vegetable matter, excessive quantities of nitrogen are not desirable because likely to produce excessive vine growth at the expense of pods. Heavy manuring the same year the crop is to be grown is not generally considered advisable. Land highly manured the preceding year usually furnishes the best condition for peas.

Commercial fertilizers are usually depended upon as the common source of plant food. Although the pea belongs to the Leguminosæ family, the early crops are started long before nitrification is active; hence light applications of nitrate of soda in these cases may be very profitable. Planting for the earliest crop is usually done in March or as soon as the ground can be prepared; therefore it is well to plow the soil in the fall of the year. No harm will be done the plants if the soil is frozen two or three inches deep after planting. Shallow planting should be the rule with the earliest crops, while the later crops, especially on sandy soils, should be planted three or four inches deep.

The distance between the rows will depend upon the nature of the growth of the varieties planted. Dwarf varieties should be planted in rows from 24 to 30 inches apart. Those of medium growth from 30 to 36 inches apart, while the tall-growing varieties should be given not less than four feet.

Double-row planting is very commonly followed with all types. This consists in planting two rows six or eight inches apart with the above-mentioned spaces between the double rows. An abundance of seed should be used to secure a good stand, especially in the earlier plantings when the conditions for germination are not as good as they are later.

Supporting the vines in various ways is a common practice in the smaller areas, with the medium and tall-growing varieties. Dwarfs, and in many cases, the medium-growing varieties, are given no support. The use of brush cut from three to four feet in height and forced in the soil along the row is a very common method. Under market garden conditions some form of trellis is more often employed. Poultry netting about three or four feet in height stretched between the double rows with proper support makes a very convenient and effective trellis. Some satisfactory support may be easily provided with posts, wire and string by anyone of ordinary ingenuity. On account of the necessity of support for the tall-growing varieties, dwarf and medium-growing sorts are more popular with the commercial gardeners.

The growing of peas as a field crop for canning purposes is a large industry in many localities. They are usually sown with the ordinary seed drill and given no cultivation after planting. They are harvested with the mowing machine, raked in the ordinary fashion and immediately hauled to the canning factory. Here they are passed through the pea hullers which shell the peas and separate them from the pods and vines. The peas are then passed over a screen which grades them into various sizes for canning purposes. The smaller peas are usually considered to be of highest quality.

Soil requirements are the same for the crop grown for this purpose as when grown for ordinary marketing purposes. On account of the fact that no cultivation is given after planting, especial care should be taken in the thorough preparation of the soil beforehand. The harvesting of peas for market purposes must always be done by hand because of the necessity of selecting the pods most suitable from time to time. Harvesting, therefore, becomes the most expensive operation in growing the pea for market.

Peas are shipped with considerable difficulty. They heat quickly even when placed in such small quantities as a bushel. The deep, narrow baskets or hampers commonly known as the Delaware peach basket are perhaps the best packages for this purpose on account of the ventilation afforded. Peas lose their sweetness and quality very rapidly after being gathered. This accounts for the flat and insipid taste of this vegetable, as it is usually shipped from the South, and as it is found in the ordinary canning pack. The best quality can be expected only when secured directly from the grower and served within a few hours after gathering. Plunging the pods in cold water immediately before shipping prevents wilting and helps to retain the original sweetness and flavor of the pea to a considerable extent. The danger of heating, except in well-ventilated packages, is increased somewhat by such a practice.

Two insects are sometimes found seriously attacking this crop. The pea aphis is probably the most widespread and most destructive. It attacks the tender terminal growths of the vines, soon destroying their vitality. This insect usually begins

to breed and becomes serious with warm weather. Very early or very late plantings may be the means of escaping serious attacks. Kerosene emulsion or tobacco solutions are considered effective treatments.

The pea weevil sometimes produces heavy loss to the dried and stored seeds. This trouble may be largely avoided by treating the seed with carbon bi-sulphide at the rate of one or two ounces to 100 pounds of seed in bins or houses constructed practically airtight. The amount of this material to be used will vary somewhat, according to the tightness of the receptacles in which the peas are to be fumigated.

The varieties of peas are numerous and selections can be made to meet all the requirements of climate and soil as well as the most exacting taste. Of the extra early smooth varieties the Alaska, with several distinct strains, as Extra Early and First of All, are widely planted. Of the early wrinkled peas the Gradus, Thomas Laxton, American Wonder and Nott's Excelsior are the most popular. Of the medium and late peas (all belonging to the wrinkled group) the Stratagem, Telephone, Telegraph, Champion of England and Pride of the Market are very common varieties. Giant Sugar, Dwarf Gray Sugar and Melting Sugar are the chief edible podded varieties. In general it may be said that the extra early varieties belong to the smooth type and possess greater hardiness than the other types and are somewhat more prolific seeders. They are not quite so high in quality as the wrinkled types. The Sugar group has a longer fruiting period, the pod remains in an edible condition for a long period of time and the sugar content is high.

PEPPER

The pepper is grown in a limited way in almost every garden, but is of minor importance commercially except in a few sections in the southern vegetable-growing districts. Small areas, however, will be found devoted to this plant in most market gardens of the North. The varietal characteristics of the pepper vary greatly, not only in the size and shape of the fruit, but also in its quality. Some are small, slender and exceedingly pungent, while others are large and thick, having little or none of the pungency commonly attributed to the fruit of this plant. Colors vary from bright reds to yellow. The pepper was formerly used almost entirely for seasoning purposes, but the introduction of the sweet or mango forms has greatly extended their use. They are now found frequently employed for pickling and stuffing purposes and in some cases for salads. For best results the pepper requires typical, rich garden loams with southern exposures. The plant is most at home under tropical and sub-tropical conditions and requires a long season for its proper development. In order to mature under northern conditions the plants must be started under glass and be transplanted after all danger of frost has passed. The plants are usually set from 15 to 18 inches apart in rows 30 to 36 inches wide.

Cultivation of the crop should consist in frequent stirring to conserve moisture and control the weeds. Harvesting is begun as soon as the fruits are full grown, but before the color develops. The sweet or mango types are usually packed in the small split baskets and shipped in crates commonly holding from six to eight baskets. The hot varieties are frequently harvested by cutting or pulling the en-

tire plant with its fruit attached and hanging up to dry. The peppers are also dried and handled in bulk.

At the present time the more pungent sorts find a wide use in the manufacture of stock foods and to some extent in medicines.

No serious insect and disease pests are present.

The common hot varieties are the Tabasco, Red Cayenne, Red Chili, Creole and Hot Bell. Of the mild-fruited varieties the most widely cultivated are Bull Nose, Chinese Giant, Ruby King and Neapolitan. The latter is especially adapted to extreme northern sections on account of the short season required for its development.

POTATO

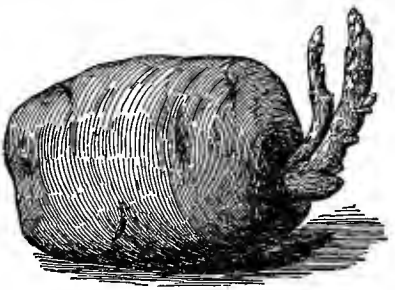
The potato is by far the most important of the vegetable crops from an economic standpoint. It is a native of America, but has been widely distributed over the entire world, where it has readily adapted itself to varied conditions of climate and soil until it has become the second most important food plant in the world from the standpoint of human consumption, being preceded only by rice. Even wheat is less extensively consumed as a food than the potato. Aside from its importance as a food, large quantities of this crop are devoted to the manufacture of starch and alcohol as well as to the feeding of stock. Numerous varieties have been developed, some of which have become permanently fitted to special climatic and soil conditions. Repeated efforts have been made to introduce popular varieties of European countries into America, but with universal failure. The popular varieties of the United States have likewise proved

themselves poorly adapted to European conditions. Some varieties seem to do especially well in the more retentive soils and cooler seasons of the North, while others are of little value except in sandy soils and the shorter, hotter seasons of the southern states. While with this great diversity of character it is possible to grow potatoes under almost any climatic conditions arising in the temperate zones, certain regions will always be found peculiarly well adapted to the production of this crop.

The potato is one of the leading truck crops of the southern trucking sections, and at the same time one of the principal crops of the northern districts. Both late and early varieties are extensively grown in all potato-producing districts, but early varieties predominate in the South, while the late predominate in the North. The two groups are founded upon varietal differences rather than upon methods of cultivation.

In a general way it may be stated that the late potato growing sections, at least upon a large commercial basis, may be said to be confined entirely to the glaciated districts of the United States. Exceptions are to be found to this statement, however. Potatoes are grown upon a great variety of soil types, and the claim is frequently made that soil influences quality to a greater extent than yield, which is modified more by climatic conditions, cultivation and the fertilizers applied. Inasmuch as the question of quality has always been secondary to the consideration of yield in this country, greater emphasis has been placed upon climatic conditions, which accounts very largely for the extensive development of potato growing in certain restricted districts. Sandy loams containing

a good admixture of clay and an abundance of organic matter are considered best suited to the cultivation of this plant. Quality is sometimes improved by growing upon more retentive soils, and with some varieties possibly upon more sandy soils, but in either case the extra quality is usually secured at the expense of quantity. The preparation of the soil is generally emphasized to a greater extent than is the case with most other crops grown under field conditions. Deep plowing is the rule and the soil should be thoroughly fined to the entire plow depth. Clover sods are desirable on account of the large amount of organic matter furnished and its consequent effect upon the looseness and friable condition of the soil. While the potato thrives upon soil containing an abundance of organic matter, stable manures should be applied with considerable caution on account of the fact that it is likely to greatly increase the presence of scab, one of the most serious diseases of the tubers. Heavy applications of manure are preferably made to a preceding crop or applied in a well-rotted condition to the clover sods in the fall of the year. For the above reasons commercial fertilizers are largely depended upon. The potato is generally considered to be especially benefited by heavy applications of potash, but in many locations much better results have been secured from the application of phosphorus. Measured by the



A SPROUTING POTATO

quantity of these various elements removed from the soil, potatoes may be looked upon as a potash crop. However, potash may be present in many soils in sufficient amounts for proper growth, while phosphorus is wanting. Under these conditions phosphorus will, of course, give the better results. Experiments carried on at the Ohio Experiment Station, as well as others, have demonstrated the value of phosphates in the production of the potato. From 500 to 1,000 pounds of commercial fertilizer, analyzing approximately 2-8-10 or in some localities 2-10-8, will generally prove a profitable investment. When the larger amounts are to be applied it is a good plan to apply one-half before planting with the drill, and the other half in the rows at planting time. The smaller amounts are usually distributed entirely in the rows. It is generally considered best to fertilize a few days in advance of the planting. During dry seasons the crop may be damaged to a considerable extent by the presence of too much fertilizer near the developing roots.

The selection of seed should be given more careful consideration than is generally done. The source of seed is especially important from the standpoint of probable infection from serious disease pests as well as length of season required for development. Northern grown seed is desired by southern truck growers, chiefly for the reason that such seed has a tendency to mature in a shorter time, thus increasing earliness. While many methods of seed selection are used by successful growers, it may be safely stated that medium or average-sized tubers, selected from high-producing hills, universally give the best results. The matter of selecting the seed with reference to productiveness is

equally as important as with corn. The Ohio station succeeded in doubling the yield of potatoes in three years' time by selecting seed from those hills of greatest production. The tubers should be cut in pieces containing sufficient starch or plant food to give a strong, vigorous growth in the new plant. Experience seems to indicate that two eyes to the piece from average-sized tubers meet these requirements in the best manner. The frequent practice of saving the smallest potatoes for seed purposes deserves especial condemnation. While the small potatoes may be used occasionally without serious deterioration, their continued use from year to year will inevitably result in loss of size and yield.

The question of the amount of seed used per acre depends very largely upon the manner in which it is planted and the distances between the rows and hills. When the potatoes are of average size, cut two eyes to the piece, planted at the usual distance of 30 inches between the rows and 10 to 15 inches between the pieces, it will require from 10 to 12 bushels per acre. With the earlier crops, especially under conditions where rot is to be feared, whole potatoes are safer to plant, and in some cases experiments have indicated better yields where whole potatoes have been used for seed.

The universal presence of scab makes it necessary to treat the seed before planting in all potato sections of this country, and the treatment has become a regular practice among all growers who pretend to be up to date, both North and South. The more common method of treatment, especially for small quantities of seed, is to soak the uncut seed for a period of two hours in a solution of formalin,

one pint to 30 gallons of water. A more effective method of treating potatoes held for seed in large quantities and in practically air-tight storage houses is by fumigation with formaldehyde gas. In generating the gas 23 ounces of potassium permanganate and three pints of formaldehyde should be allowed for each 1,000 cubic feet of space. The potassium permanganate is placed in shallow pans at various points in the storage and the required quantity of formaldehyde poured in. The building should be quickly vacated after these materials are placed together and kept tightly closed for twenty-four hours, when it may be opened, thoroughly ventilated and the potatoes taken out as desired.

POTATO PLANT SHOWING TUBERS AND ROOTS

Potatoes are extensively planted both by hand and by machinery. Hand planting is universal in small areas, where the expense of the machine planters would not be justified. In the large areas the machine planters are to be preferred, not only because the planting will be done more economically, but will generally be done better. It is especially important that the pieces be cut uniform in size and the required number of eyes in each piece secured. When the potatoes have been dropped by hand for the very early crop, it is a good practice to cover with the plow quite

deeply, leaving a decided ridge along the row. This gives ample protection during the cool and frosty weather. After the weather becomes warmer and the tubers start into growth, these ridges may be harrowed down with the ordinary smoothing harrow by passing back and forth across them at right angles. Such a practice loosens and aerates the soil and at the same time destroys great numbers of germinating weeds.

Many growers successfully follow just the opposite plan of covering at planting time. Only sufficient dirt to cover the potatoes one or two inches deep will be pulled into the furrows. Then after the potatoes appear above ground the stocky growth of the top is covered up entirely with two or three inches more soil. While this does not provide the protection from cold and frost the former plan does, it has a tendency to increase the branching of the stems and thereby increase the yields.

The depth to which potatoes should be planted depends upon the season, the soils, and the plan of cultivation to be followed. Early potatoes should be planted deeper than those planted later in the season. Shallow planting should be practiced on more retentive and heavier types of soils. Hill or ridge culture does not require as deep planting for the best results as level culture. Three inches should be considered the minimum depth, while six inches is perhaps the maximum. A good average for good potato soils where level cultivation is followed is from four to five inches. Notwithstanding the fact that practically every experiment with the various types of cultivation has been in favor of level cultivation, many growers still persist in following the plan of hilling or ridging their crop. While the

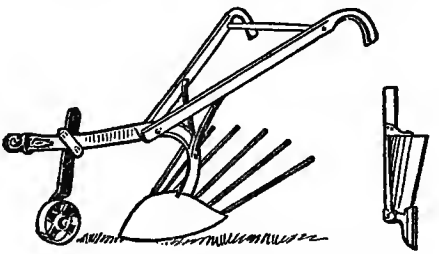
tubers are kept more perfectly, and with less damage from sun scald, the dangers of drouth much more than overbalance these advantages. Cultivation is usually done with any of the modern two-horse cultivators or the five-tooth single-horse cultivators. In either case the shovels or teeth used should be of the narrowest type in order that the surface of the soil may be left as level as possible after cultivation. Early cultivations should be comparatively deep in order to thoroughly loosen the soils before serious danger to the roots is likely to occur. Later cultivation should always be shallow, generally not more than two or three inches in depth in order to kill weeds and to lessen evaporation.

When grown upon a small scale, harvesting is always done by hand. The potato fork or potato hook are the implements most commonly employed for turning the tubers out of the soil. Hooks and forks with round rather than flat tines are to be preferred, as they damage the potatoes much less. Between the hand tools and the large harvesting machines comes first of all the common turning plow. This is a poor implement for digging the crop on account of the fact that a large number of the tubers will be cut or bruised and a considerable quantity be left in the soil. This method of digging is extremely common in truck-growing sections of the North and may be found frequently practiced in the smaller areas southward.

The next tool available for use is a special plow made to run under the rows, the tops and soil being separated more or less successfully by a series of iron rods running backward from the moldboard in a fan-shaped fashion.

The modern potato digger is in universal use over

the large commercial areas. It consists of a broad steel point which runs under the hills, lifting the tubers and tops and carrying them upward and backward over a screen of steel bars. The earth is permitted to fall through these bars while the potatoes are carried to the rear of the machine and dropped on the ground. The method of gathering the potatoes from the field is largely a local practice, depending to a considerable extent upon whether the potatoes are to be marketed direct from the field or stored and also upon the methods of digging em-



AN INEXPENSIVE POTATO DIGGER

ployed. A common practice in many localities is to gather in crates in which they are taken either to storage or to the car for shipping. The half-bushel split baskets are frequently used for gathering, being emptied directly into the gunny sack in which they are to be shipped. The truck garden crop of the South is nearly always shipped in ventilated barrels, the top being covered with burlap tightly stretched under the top hoop. Sacks are sometimes employed and the crop sometimes shipped in bulk. The latter methods are more common with the late crops handled in the mature state.

Sorting and grading are always practiced to a

greater or lesser extent, but unfortunately, from a successful market standpoint, in all too many cases this work is either poorly done or sadly neglected. Potatoes are graded in various ways into more or less loosely defined grades. The small grower usually grades his crop in the field, as it is picked from the ground. Extensive growers use mechanical devices of various types made and sold by the manufacturers of potato machinery everywhere. When the crop is to be stored it is a common practice to gather in crates and haul to the storage, where it is run over the grader. When the crop is being sold directly from the field, the graders are usually mounted in such a way that they may be hauled along to receive the tubers from the pickers.

The late potatoes are marketed in a very different way from those in common practice with the early crop. If the crop has been allowed to properly mature and has been kept free from the late blight by frequent sprayings, it usually can be stored without difficulty, where ordinary care in handling has been practiced. The relative advantage of selling direct from the field or storing for later markets and possibly higher prices, depends upon a number of factors often either overlooked or at least not given the consideration their importance justifies. The expense of handling is at least doubled over that necessary in direct selling. The added cost of storage equipment is an important consideration to be kept in mind, and the possible, even probable, losses from shrinkage, freezing and rot are larger than most people think. Forty cents a bushel at digging time will probably return as much profit as 75 cents a bushel April 1st. Many condi-

tions, however, arise which make it profitable to store. In general, however, it may be said that if the price ranges anywhere from 40 cents to 50 cents at harvest time, taken year in and year out, the better plan would be to sell direct rather than to store. The winter crop is shipped and handled in bulk, barrels or bags. Some sections ship almost entirely in bags, while others are partial to the barrels.

Satisfactory storage for the potato may be provided in pits or barn cellars, root cellars and in frost-proof storage houses, especially constructed for the purpose. The quality of the potato is frequently very greatly lessened by the maintenance of too low a temperature while in storage. A temperature of from 35 to 45°, maximum and minimum, with an average of as near 40 as possible, will usually be found to give the best results. Sufficient moisture should be present to prevent withering, but much excess beyond that point encourages rot and decay.

Several insects and diseases are found attacking the potato. The most common and widespread insect pest is the Colorado potato beetle. This insect is a native of the Rocky Mountain regions and has spread backward over the eastern part of the United States since about 1850. It is now largely held in control by natural enemies, but becomes sufficiently numerous in some seasons to require spraying for its control. Paris green at the rate of one pound to 50 gallons of water, or arsenate of lead paste (one and one-half pound powdered) at the rate of three pounds to 50 gallons of water, prove effective remedies for this insect.

The flea beetle frequently becomes seriously troublesome, attacking the leaves in large numbers

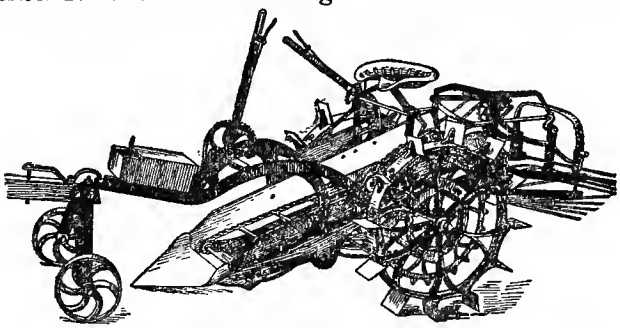
and eating numerous tiny holes in the foliage. This insect has been found to be effectively controlled in those regions where bordeaux mixture is regularly used for the late blight. Bordeaux mixture does not kill the insect, but acts in the nature of a repellent.

The so-called late blight is by far the most serious disease. It attacks the leaves and stems, quickly spreading to the tubers, which are checked in growth, and rot usually results. Spraying with bordeaux mixture has been found to effectively control this disease. The first application should be made when the young plants are four to five inches high. This treatment should be repeated at intervals of 10 days to two weeks until the crop is practically mature. Lime and sulphur has likewise proven an effective remedy used at the rate of one gallon of the commercial form to 40 gallons of water.

The potato scab, already briefly described in connection with the seed and its treatment, appears as rough, irregular brownish black spots upon the surface of the tuber. The fungus causing this trouble lives from year to year in the soil primarily upon decaying organic matter, but under certain conditions this disease is able to transfer itself to the developing tubers of the potato, and is also found to a considerable extent upon the beet. The disease is communicated to the new potato, both from the old seed and directly from the soil, but apparently to a much greater extent directly from the seed. Treatment from the seed, as described on pages 204 and 205, prevents the troubles spreading from the same, but does not, of course, prevent all scab, as some of the tubers are likely to be attacked directly from the soil. Such a large percentage of scab is prevented

by seed treatment, that the practice has become universal with all growers who pretend to be progressive.

During the last few years a new disease of the potato has made its appearance and has already become seriously troublesome in many sections. This is a Fusarium disease, becoming apparent when the potatoes are perhaps a foot high or thereabouts. A dull, unhealthy appearance of the foliage results, followed by a rolling or curling of the margins of the leaves. The disease progresses rapidly, causing the tops to fall and ripen prematurely. The trouble extends downward through the stems and fre-



A MODERN POTATO DIGGER

quently into the tubers. A thin slice across the stem end of the tuber often reveals the presence of this trouble by the brown stain and streaks easily visible. Special care should be taken in selecting the seed to see that it is free from this infection. The disease comes to us from European countries, probably by the way of Canada where it has caused enormous losses. Collecting and burning the tops after digging will diminish the disease, and make rotation (the principal remedy) more effective.

The list of varieties of the potato perhaps changes more rapidly than with any other widely cultivated plant. The varieties popular with our grandfathers are scarcely recognized, except as a matter of history, by the present generation. The profitable cultivation of a variety of potatoes rarely extends over a period of more than fifty years. This is largely accounted for by the propagation of the potato from the abnormally developed parts, under which conditions deterioration invariably takes place after a considerable length of time.

Varying seasons, soils and uses make a wide range of variety selection possible. Under southern conditions, especially for trucking purposes, Bliss Triumph, Bovee, Irish Cobbler, Early Ohio and Early Rose are largely cultivated, Bliss Triumph being by far the most popular of the list. Under northern conditions the Early Ohio, Irish Cobbler, Early Rose and Beauty of Hebron are extensively grown as early sorts, while the Green Mountain, Rural New Yorker, Carman and Sir Walter Raleigh are the leading winter varieties.

RADISH

The radish is one of the most popular and important of the spring and early summer vegetable crops. It is very easily grown and reaches an edible size in from three to six weeks after sowing. Although one of the minor garden crops, it is grown in large quantities by the gardeners directly supplying city markets, and in certain sections of the South is grown extensively as a truck crop for northern markets. It is also being more extensively used as a forcing crop in greenhouses and hotbeds. Frame and greenhouse forcing has be-

come so extensive that in many localities varieties have been developed particularly adapted to these conditions. Under out-of-door conditions the radish is seldom given entire use of the ground, but is usually grown as a companion crop with others requiring a longer season for their development. All sorts of combinations will suggest themselves to wide-awake gardeners.

The radish is pre-eminently a cool weather plant and requires an extremely short season for its maturity. These factors make it possible to grow this crop under a very wide range of climatic conditions.

The best soils for the radish should be extremely fertile and friable. Sandy loams are to be preferred. Heavy soils, either indoors or out, produce rough and ill-shaped roots with many fibrous laterals. The plant is very hardy and can be sown out of doors as soon as the soil can be properly prepared. The radish is universally grown from seed, being one of the garden vegetables rarely transplanted. The ordinary seed drills are used and the rows are spaced from 8 to 12 inches wide and the seed dropped at the rate of from 30 to 50 seeds per foot. They should be planted from three-quarters of an inch to an inch in depth.

The cultivation of the radish is an important matter. The thorough preparation of the soil and the quickness with which the crop matures give weeds little opportunity for development. The wheel hoes and hand weeders are both used when necessary to keep the soil loose and mellow. Radishes are harvested as soon as they reach edible size, and tied in bunches of from five to ten each, according to size and time of season. For shipping they are

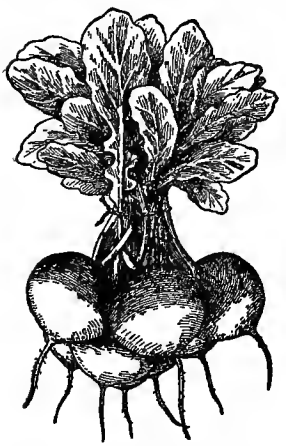
thoroughly washed and packed in ventilated barrels or half barrels with the roots toward the outside. The radish seems to be somewhat more exacting under greenhouse and frame conditions than in the open. More difficulty will be experienced with the temperature running too high than too low. From 45 to 50° at night and not over 65° during the day should be maintained if possible. Especial attention should be given to ventilation and a sufficient supply of moisture. Radishes grown under glass do not usually find a ready sale before the holiday season. Planting should, therefore, be made from the 1st to the 15th of November.

The Globe or button types are preferable for forcing under glass, on account of their quick maturity and their small tops, which permit close planting.

Insects and diseases are not particularly troublesome. The most annoying insect is the cabbage root maggot, which, in given localities, attacks the roots, rendering the crop unsalable by the presence of the dark brown spots or streaks through the root. Little can be done to control this pest, except to rotate the crops. The turnip-shaped radishes may be treated with lime water with some degree of success, but with longer radishes it is impossible to get the material deep enough into the soil without too much trouble and expense.

The flea beetle and plant lice sometimes attack the radish. The latter are especially troublesome under greenhouse conditions. Tobacco dust is an effective remedy. Radishes are particularly tender to tobacco smoke, and dusting will be found a safer method of application.

Varieties of radishes are numerous and with sufficient differences in their characters to meet all requirements. French Breakfast, Early Scarlet Short Top, Round Red Forcing and Scarlet Frame are the leading varieties of the flat or turnip-shaped group, grown both under glass and out of doors. The Long Scarlet, Cincinnati Market, Icicle, and Chartier are the leading varieties of long radishes grown out of doors as a main crop, but sometimes forced under glass. The Chinese Rose and White Chinese are the leading varieties of the so-called winter radishes. This group is comparatively unknown in the United States, but is finding a place in the gardens supplying the large markets. They make a slow growth, have firm, hard flesh and can be stored as readily as turnips. The seed of these varieties is usually sown in late July or early August for the winter crop. They come in direct competition with the turnip and have few points of superiority over this older and better-known vegetable. Its increase in popularity in all probability will, therefore, be slow.



A GOOD BUNCH OF RADISHES

RHUBARB

As far as the home garden is concerned, rhubarb may be looked upon as a companion of the horseradish. A few plants are always found in connec-

tion with the home garden, on account of the ease with which it may be grown and the high value placed on the succulent, highly acid leaf stalks as a source of pie material. It is also in great demand in the form of sauces and stews in the very early spring after the heavier and more restricted diet of the winter months. It is naturally a northern crop, not particularly well suited to truck farming purposes, and not adapted to long-distance shipments. The possibilities of rhubarb as a forcing plant have only been appreciated within the last 10 or 12 years, but at the present time most large gardeners devote some time to the growing of this crop out of season. The plant is also forced to a considerable extent under home conditions and can be made to give a continuous supply from early January until the outdoor crop comes on. The value of the crop depends very largely upon its extreme hardiness and earliness. The thick roots store up a large amount of food during the growing season, which causes the plant to respond quickly to the first stimulus of spring.

The plant is a gross feeder and does best upon the deep, sandy loams, well supplied with large quantities of decaying organic matter. It responds readily to heavy applications of nitrate made at frequent intervals in the early springtime and an extra application given at the time harvesting ceases.

Plants are readily propagated from seed sown in the open. This is generally the most satisfactory method, taking everything into consideration. The varietal characteristics of rhubarb are not well established and a large percentage of the seedlings do not come true to type. Division of the crown is frequently employed for propagating purposes on this

account, but does not usually give such strong, vigorous plants as direct propagation from the seed. Under permanent field conditions the crowns should be planted in rows four feet wide and the plants from three to four feet apart in the rows. Thorough tillage throughout the entire season is important in order that the early succulent leaf stalks gathered for market may be as large and tender as possible. Late cultivation is also necessary in order that the largest possible amount of reserve food may be stored in the roots for the coming season's growth.

It is highly important that the production of seed be prevented by the removal of the seed stalks as they appear from time to time. Profitable forcing of the rhubarb may be carried on in the following manner. Preferably two-year-old crowns are lifted from the field in the fall of the year and closely packed on the surface of the soil out of doors, being covered with an inch or two of soil to prevent drying until severely frozen. The crowns may then be brought into the cellar or forcing houses where temperature and moisture may be controlled. Growth starts rapidly, and harvesting may be begun from four to six weeks later. Forcing in dark rooms or cellars is a common practice. Under these conditions the leaf blade fails to develop, while the stalk makes a larger growth and is of a distinctively better quality. The crowns may be brought in from the open from time to time as desired, in this manner producing a continuous succession throughout the entire late winter and early spring. A temperature of from 40 to 60° is usually considered best for the crowns after forcing begins. Higher temperatures give quicker results, but spindly and unsatisfactory stalks. In any case

strong, vigorous roots are necessary for profitable returns. Large, well-grown, one-year-old roots are frequently used and give splendid results. The large number of crowns required to properly occupy the space is perhaps the chief objection urged against the one-year-old roots.

In harvesting, the stalks are pulled from the crown of the plant rather than cut. The larger part of the leaf blade should be removed at once. This is important, as the loss of water is lessened and the stalks remain tender for a longer period of time. The stalks are usually tied in bundles from three to 10 each, depending upon size and the time of year.

Insects and diseases are comparatively rare upon this plant. The rhubarb beetle sometimes does some damage by puncturing the stalks while depositing its eggs. This usually takes place, however, after the pulling season is over.

If the crowns are kept too wet and poor ventilation provided under forcing conditions, rot of both crowns and stalks may become serious.

Linnæus and Victoria are the two popular varieties usually grown. The former variety is generally to be preferred on account of the larger percentage of bright red stems and their greater brittleness.

SALSIFY

Salsify is a vegetable grown to a very limited extent by a few commercial gardeners and rarely found in the home gardens of the country. It is a hardy plant, easily grown, and lives through the winter without difficulty. It may be used stewed and creamed, and is especially desirable for soups. Its flavor decidedly resembles that of the oyster, hence the name

"oyster plant" by which it is commonly known. This crop may be easily dug and stored for winter use, but like the parsnip should be left in the soil until frozen. It deserves a wider popularity than it now enjoys. It is a deep-rooted plant, thriving best on the rich, deeply tilled garden loams, and may in every respect be considered a companion plant for the parsnip.

The same types of soils are required and propagation is the same. The seed should be planted at practically the same time, and the roots dug, stored and harvested in the same manner.

When prepared for market the long, slender roots are washed and tops cut off, leaving two or three inches of the leaves. They are then tied in bunches of from five to ten plants each, depending upon their size.

SPINACH

Spinach is by far the most important vegetable commonly used in the form of greens. It is more nutritious than most plants used in this manner, and is especially recommended as a healthful source of iron in the human system. This crop is grown in a variety of ways. It is an important truck crop in certain sections of the South, but the area over which it may be profitably cultivated is limited by its bulky character and relatively high freight rates on the same. It is extensively grown in the North as a hotbed and cold-frame crop and under field conditions is sown both in the fall and in the spring. When sown in the fall some light mulching is required to protect it through the winter. A moist, sandy loam of high fertility is required for the best results with spinach. The value of the plant de-

pends upon rapid, vigorous growth, impossible without large quantities of available plant food. Well-rotted stable manures are especially valuable and fertilizers high in nitrogen are also used very profitably. The fall sowing should be made from the middle to the last of September. From 25 to 30 pounds of seed are required per acre. Sowing is usually done with the common seed drill in rows from 12 to 15 inches apart.

In harvesting, the plants are trimmed of their dead leaves before packing for market. It is a common practice to throw the land for spinach into broad beds, carrying from six to eight rows. A space or back furrow from 18 to 24 inches is left between the beds for drainage and convenience of the workers.

The green fly is the worst pest of the spinach. Plants making a slow unsatisfactory growth are almost certain to be attacked by this insect. Great care should be taken to avoid checks in growth, for once infected it is very difficult to eradicate the insects. Kerosene emulsion proves a very effective remedy, but it is much cheaper and easier to prevent the difficulty by providing the proper conditions for rapid and continuous growth.

Rust is a common disease, usually attacking the winter crop and associated with unsatisfactory conditions for normal growth, such as late planting and severe winters. Rust is indicated by stunted growth and yellowish spots on stems and leaves. Plants are seldom killed by rust, but the extra trimming required before they can be satisfactorily prepared for market, together with the lessened yield secured, usually make attacked areas unprofitable. Proper preparation of the soil, early planting and good cultivation generally avoid the difficulty.

Varieties commonly grown are the Norfolk, Victoria, Long Season, Prickly Seeded and New Zealand. The latter is a variety not well known, but is especially well adapted to summer conditions and deserves a place in the home gardens.

SQUASH

While the squash is commonly found in a limited way in almost every market, its value and merits are fully appreciated by few people. Large areas devoted to the cultivation of this crop are comparatively rare, while its cultivation in the home gardens is more a matter of accident than design. The cultivated types and varieties are extremely variable and can be made to provide a continuous supply of this vegetable from early summer until late winter. On account of the ease with which it may be stored, it should be more highly esteemed in connection with the home gardens, especially in providing a greater variety of vegetables for consumption during the winter months. Its commercial cultivation is confined almost entirely to small areas in connection with market gardens surrounding the larger cities.

Squash, with its variable characteristics, lends itself to a great diversity of soils and a wide range of climatic conditions. The winter squashes thrive best upon the clay loams. The plant is a rank feeder and should be supplied with an abundance of available food, a condition most satisfactorily met by the liberal use of well-rotted stable manure in the hills. Early plowing should be the rule and the soil fined and compacted all the way down. The hills of the large-vining varieties should be from seven to eight feet apart in each direction. The

rows are usually laid off in checks, at the intersection of which a good-sized excavation is made and from a peck to a half bushel of well-rotted compost placed in the bottom. Three or four inches of earth should be drawn over this material and the seeds planted from one to 1½ inches deep in this covering of soil. An abundance of seed should be used in order to secure a good stand and provide for the dangers of insect destruction. From ten to fifteen seeds should be planted in each hill. After the young plants have become thoroughly established and begin to vine they should be thinned to from three to four plants to the hill. Squash is extremely tender to frost and should not be planted in the open until all dangers of this kind are passed and the soil well warmed. The bush varieties differ somewhat from the running types in their habits of growth and require less space for their proper development.

Cultivation should be directed toward keeping the soil loose and mellow, especially about the hills, in order to conserve moisture and induce rapid growth. In localities where heavy rainfalls are common the hill should be slightly raised above the surrounding level.

The harvesting begins with the bush type of the squash as soon as the fruit is full grown, but before the shell begins to harden. After the shell of this type hardens the fruit is considered as being past its best stage for edible purposes. Just the opposite is true with winter squashes. They are rarely harvested and used before they are thoroughly mature, in which condition the shell becomes extremely hard and resistant. The latter type may be readily stored under proper conditions and kept until early spring. Successful storage is largely

a matter of careful handling. The squash should be removed from the vines with the stems attached before severe frosts occur, but should be left in the field as long as possible in order that they may reach their full maturity. Frost proof, dry conditions should be provided in the storage, where the temperature may be held at from 40 to 50 degrees. It is especially important that ample ventilation be provided. Commercial storages are usually built with racks sufficiently wide apart to permit only of a single layer on each. Ample space should be left between the rack and the wall for free circulation of air. Careful handling should be the rule from the time the fruits are separated from the vines. The ordinary house cellar, kept comparatively dry, provides a very satisfactory storage for family use. The dry conditions usually found in such a cellar, while detrimental to the storage of most vegetables, will be found satisfactory for this one. Summer squashes are usually marketed in hamper baskets when shipped to distant points. They frequently bring good prices, but will not keep for any length of time and must be sold at once. The winter squashes satisfactorily stand long shipments, and are usually packed in ventilated barrels covered with burlap.

In addition to the common insects and diseases described as troublesome on the cucumber, the squash is troubled by the squash vine borer. This insect deposits its eggs near the base of the plant and when the larvæ hatch they eat their way into the stalks, causing them to wilt and die. The most satisfactory treatment is to gather and burn the vines as the crop is harvested. Later attacks are minimized by this treatment. Repellents, such as

corn cobs soaked in creosote, placed around the hills are sometimes used with partial success. In small areas the vines may be buried in the soil two or three feet away from their base. The vines root readily at the point where they are covered with soil, and inasmuch as the attack usually comes close to the base of the vine another set of roots is already developed to continue the growth.

The principal varieties of summer squash are the Early White Bush, Yellow Bush and Summer Crookneck. The most popular varieties of the winter squash are the Green Hubbard, Golden Hubbard, Boston Marrow, White Crookneck and Fordhook.

The pumpkin is a member of the same species as the summer squash. Great confusion arises from the common use of the two terms, pumpkin and squash. In common usage, however, the term pumpkin is applied to the large-growing running varieties of the summer squash, while the term squash is applied to those varieties having a bush-like habit of growth. Pumpkins are considered of less importance than squashes, but the demand for the former is rapidly increasing and their uses are becoming more varied and common. Large quantities of pumpkins are now canned in various sections of the country. It is almost universally grown as a companion crop with corn and under favorable conditions adapts itself to these surroundings with good results. The possible yields of pumpkins when given the entire soil to themselves and properly cared for are almost beyond belief.

The pumpkin is generally preferred to the squash for pies, and its common use for this purpose needs no further comment. It is also grown to a considerable extent for stock food, but when so used

must be looked upon as a field crop rather than a horticultural crop.

Rich, moist soils are necessary for the proper growth of this crop. It rarely does well on the poor upland soils that dry out early in the season. They should be harvested with the stems attached, when well colored and before heavy frosts, if they are to be stored for winter use. Stored as already described for winter squashes they can be kept throughout the winter months without difficulty.

Various varieties are popular in different localities. The Large Cheese is generally preferred for canning and holds well in storage. The selection of varieties, especially for home use, depends very largely upon location and personal tastes.

SWEET POTATO

The sweet potato finds its most favorable conditions of soil and climate south of the area in which the white or Irish potato thrives best. Both as a stock food and a food for human consumption, its value is very much higher than the Irish potato, which makes this plant one of unusual economic importance. The sweet potato is consumed almost to the exclusion of Irish potatoes in the South, while the honors are shared very extensively throughout the northern markets. Large quantities are now being canned and they promise to also become an important source of commercial alcohol. This plant requires high temperatures and an abundance of sunshine. Heavy rainfalls are desirable during the growing period, but become decidedly detrimental when the crop is maturing.

The sweet potato is commercially impossible in the North on account of climatic conditions. It is, nevertheless, grown in a small way in many home gardens. The quality, however, is decidedly inferior and the yields low. While the potato is a heavy feeder and revels in rich soils, it demands a sandy type that warms up and dries out rapidly after heavy rains. Drainage must be practically perfect, although retentive subsoils are not considered a disadvantage. In the South sweet potatoes are frequently grown profitably on soils considered too poor to satisfactorily grow cotton and tobacco.

To prepare the land for this crop, it should be plowed early, and deeply and thoroughly pulverized by the use of the disk harrows at intervals of a week or ten days until the season of planting arrives. A week or two before planting, the commercial fertilizer to be used should be applied with a grain drill. All the way from 500 to 2,000 pounds per acre are applied by commercial growers, perhaps 1,000 pounds being about the average. Planting on ridges and on the level are both common. Ridging is generally considered necessary where heavy rains prevail during the growing season and washing is likely to occur.

Propagation is extremely important with this crop and success depends largely upon the care taken in this work. The crop is usually started from slips or sets grown from tubers first bedded in clean, sterilized sand which has been placed over the manure in the ordinary hotbed. After the slips have grown from the tuber to the height of six or eight inches they root at their base and are readily separated by means of the fingers, working down through the loose sand. The slips should be broken directly from the tuber in order to

secure as many of the roots as possible. Other shoots readily develop after the first ones have been broken off and three or four crops may be secured. The later shoots, however, are weaker and not so satisfactory for planting purposes. This plan is frequently modified somewhat in planting large areas. A small area will be planted from plants secured as described above and planted very early in the season. By time to plant the main crop these vines will have made considerable growth and are cut and placed in the soil where the plant is expected to develop from the green stem cuttings. These green cuttings root readily and give excellent results. This plan sometimes avoids some of the serious diseases common to this crop.

In level culture the planting distances are usually 30 to 36 inches between the rows and from 18 to 24 inches in the row. When planted on ridges the rows are usually from 30 to 40 inches wide with the plants from 12 to 18 inches apart in the rows.

Cultivation should be started as soon as planting is completed. Spiked tooth cultivators are used as often as necessary to maintain a thorough mulch and until vine growth prevents further tillage. Little hand hoeing should be necessary where proper preparation and careful cultivation have been given. Sweet potatoes are usable as soon as they are of sufficient size, but their quality is low and the yield poor. The high prices secured often justify early digging however. Where the crop is intended for storage, digging should be delayed as long as possible in order that the maximum growth may be secured and the tubers become thoroughly mature.

In harvesting the roots are usually plowed out with a special form of plow, carrying two roller

colters running on either side of the row to cut away the vines. The tubers are usually allowed to lie in the sun for a while before gathering, after which they are hauled to the storage house on springs. It is especially important that every operation in connection with harvesting be carefully done in order that injury to the roots may be reduced as much as possible.

The sweet potato is subject to a number of diseases under storage conditions, and the losses at this point are enormous every year. The usual method of storage is to place them in large bins in frostproof buildings especially designed for the purpose. As the potatoes are being brought in from the field a temperature of 85 to 90 degrees should be maintained for ten days or two weeks in order to drive out quickly the surplus water from the tubers. After this period the temperature is gradually lowered to from 50 to 55 degrees, where it is held during the remainder of the storing period. Any sudden changes in temperature resulting in condensation of moisture on the roots usually prove disastrous.

Sweet potatoes are graded in various grades, due to the demands of the market, and to meet local needs for seed purposes. They are commonly marketed in hampers and barrels.

No serious insect pests are found attacking the sweet potato, but the black and soft rots are often very destructive. The black rot does most injury to the crop while still in the field, while the soft rot affects tubers only while in storage. Black rot can be controlled by a wide crop rotation and by growing seed from slips unaffected. Disease-free tubers may be most easily secured by the use of vine-cutting plants, grown on clean soils.

Soft rot is controlled entirely by carefully sorting and handling the tubers throughout the entire process of harvesting and storing and by maintaining the proper temperatures, especially in the earlier stages of storage. Treatment of the roots before bedding for propagating purposes with the ordinary formalin solution used for potato scab has proved very effective in a number of experiments.

A long list of varieties is found under cultivation, but the leading ones are the Big Stem Jersey Yellow, Jersey Red, Southern Queen and Red Bermuda. The term yam is often improperly applied to the soft-bodied, moist varieties of the sweet potato. This type is not shipped to any great extent, because the tubers do not handle well and are extremely subject to rot.

TOMATO

The tomato is a native of America and a member of the nightshade family. It was formerly considered to be poisonous and for this reason its cultivation made slow progress in many sections for a long time. This prejudice proven fallacious, its popularity increased rapidly, until at the present time the tomato may be looked upon as one of the vegetables grown everywhere. It is a plant rarely found missing from the home garden, and is cultivated in large areas as a truck crop in the vicinity of every market. Thousands of acres are grown for canning purposes, and it has become one of the three leading vegetables extensively forced under glass during the winter months. The tomato is a tropical plant, requiring relatively high temperatures and an abundance of sunlight for its best development. In spite of this fact, however, it is successfully grown as an out-

door crop in the North by starting the plants under glass and having them well advanced by the time they can be safely transplanted to the field. The plants are very tender, and nothing is gained by starting them out of doors until all danger of frost is passed and the soil has become well warmed.

The ideal soil for the tomato seems to be deep, well-fertilized and well-drained sandy loams. It

A WELL-GROWN TOMATO PLANT READY FOR FINAL TRANSPLANTING

does reasonably well, however, upon a wider range of soil types than most plants. The heavier clay soils, properly fertilized and handled, frequently give excellent returns, and the fruit is usually more solid, and for this reason generally considered better for canning. The extreme sandy soils give quicker re-

turns, but the yields are usually low. The soil should be plowed as early as possible in the spring and stirred frequently until planting time in order that it may become thoroughly well aerated and warmed. Fertilizers are liberally used upon the land to be planted to tomatoes. It is easy, however, to stimulate an excessive vine growth at the expense of fruit production by over-applications of nitrogenous materials, especially those decomposing slowly and rendering their nitrogen available late in the season. Heavy applications of stable manure are desirable, but are preferably made to a preceding crop, thus becoming well decomposed and well mixed through the soil before tomatoes are planted. Commercial fertilizer containing 2% of nitrogen in the form of nitrate of soda, 8% to 10% of phosphorus and 6% to 8% of potash will usually be found a very satisfactory formula. This fertilizer should be used at the rate of 500 to 800 pounds per acre. Small applications of nitrate are frequently made to the plants after they have become well established. This stimulates a rank, vigorous growth in the early part of the season. The nitrates, however, are quickly exhausted, bringing about a natural check later in the season, which is conducive to fruitfulness. For the early crop both North and South, except south of the frost belt, the plants are started under glass from four to ten weeks before they are to be transplanted out of doors.

The seedlings should be "pricked" off into small pots, flats or beds as soon as they have become of sufficient size to handle conveniently. Especial care should be given to ventilation, watering and temperature in order that the plants will receive no check at this stage. When grown in pots

the plants should be shifted to pots of larger size when the soil becomes well filled with roots; and when grown in the beds it is usually necessary to give at least one shift to greater distances apart in order that strong, stocky plants may be ready for field planting. Grown in this manner the plants are frequently from 10 to 15 inches high, usually carrying a number of blooms, and in many cases small tomatoes, by time for transplanting. By careful transplanting to field conditions, selecting rainy or cloudy days or confining the transplanting to the late afternoon and evening, these large plants may be started without the loss of fruits and blooms, which will mature very early. Where the plants are kept for a considerable length of time after the seed has been sown in the greenhouse they often become too tall for the best results when transplanted in the ordinary way. The objection to such plants is largely overcome by plowing or digging a furrow three to five inches deep in which the root and stem are placed and covered until only six or eight inches of the leafy tip remains above the ground. Roots readily develop from the buried stem, thus quickly increasing the feeding surface and hastening growth. The plants for the mid-season or late crop are often started from seed sown out of doors. They are not generally transplanted until taken from the seed bed to the field. Such plants are lacking in vigor, but when transplanting is done under favorable conditions in well-prepared soil, they will usually give good results.

The plants grown for the early markets are nearly always trained in some manner. The most popular method of training is to drive a stake for each plant. This stake should be from one to two inches in diameter and about five feet in length. It is driven

into the soil near the plant at transplanting time or soon after. All the lateral shoots are kept closely cut off, only one stem being allowed to develop. This is tied to the stake from time to time as growth progresses. Usually four ties are required from the ground to the top of the stake. After the plant has reached the top of the stake the tip is pinched out, thus checking rapid terminal growth. Staking, together with pruning, always gives earlier maturity and cleaner fruit than can be secured in the ordinary way. The yield per acre is also increased by staking, on account of the fact that the plants may be placed closer together. The cost involved, however, is considerable and is usually prohibitive except in connection with the very early crops.

The matter of pruning or pinching back the lateral buds as they develop in the axils of the leaves should receive much more attention under field conditions where training is not practiced. In some experiments carried on by the author the yield under ordinary field conditions was considerably more than doubled by three prunings, confining the growth to two and three stems and keeping the laterals from these during the earlier part of the season.

Cultivation should begin as soon as the plants are transplanted and be continued as long as it is possible to pass between the vines. Plants are usually set in rows 30 to 36 inches wide and from 18 to 24 inches apart in the rows where the staking method is followed. Under field conditions without training it is a common practice to set the rows 3½ to 4 feet wide and the plants from 2½ to 3 feet apart in the rows. Where plenty of land is available, check-rowing 3½ feet each way is a common practice which greatly lessens the cost of production.

For markets near at hand the tomatoes should be allowed to become fully ripened on the vines. Frequent pickings should be the rule in order that the fruits sold may be uniform in ripeness and quality. When gathered for shipment to distant markets, the fruits should be picked when showing the whitish coloring or only slight indications of reddening.

The tomato is handled in all sorts of packages. The bushel basket is largely used for close markets, especially in the North. The 20-pound split baskets and the Climax baskets are frequently used in shipping the forced, and in some cases, the out-of-door crop from the far South. Southern tomatoes, however, are largely shipped in the four and six-basket carriers.

The yields of tomatoes vary widely, as might be expected from the fact that on account of its wide distribution it is frequently planted on soils poorly adapted to its culture. As high as from 800 to 1,000 bushels have been secured, but Tracy states that the average yield when grown for canning purposes does not exceed 100 bushels per acre. From 200 to 400 bushels should be secured as an average yield under market garden conditions.

The forcing of tomatoes has become an extensive industry, but on account of the tropical nature of the plant, it requires structures built in the best possible manner and carefully arranged in order that temperature, moisture and ventilation may be under thorough control. For obvious reasons the tomato must be closely planted and trained to a single stem under greenhouse conditions. An abundance of room must be provided for an upright growth. Low houses, therefore, are not desirable for forcing this crop.

Under greenhouse conditions the tomato is subject to a number of diseases, the most serious of which fall under the head of soil diseases. Thorough sterilization of the soil is necessary from year to year.

Pollination must usually be done by hand, and large quantities of fertilizer and stable manure judiciously used. Where proper conditions can be given, the tomato proves a very profitable greenhouse plant. It is usually grown as an early fall and late spring crop, the intervening period being devoted to lettuce. Plants for forcing purposes are frequently grown from leaf and stem cuttings taken in August from strong vigorous plants.

Few insect enemies are found troublesome upon the tomato. The tomato worm is the most serious pest out of doors, but is easily held under control by handpicking. It is more destructive in the South than in the North.

The white fly frequently becomes a serious pest in the greenhouses. This insect is readily held in check by fumigation with tobacco, as described elsewhere.

Mildew is a common disease often very destructive in the forcing house. Slight yellowish discolorations appear over the surface of the leaf, followed by wrinkling and drying. The older leaves are usually attacked first. The disease spreads quickly from leaf to leaf until the plant is practically destroyed. Infected plants should be removed at once when discovered. Frequent spraying with bordeaux mixture, or, if the fruit is maturing, copper carbonate solution will prove effective in controlling this trouble. The copper carbonate solution is prepared by dissolving one ounce of copper carbonate crystals in three pints of ammonia. This stock

solution should be diluted one gallon to 25 gallons of water and sprayed on the plants with a fine nozzle.

The dry rot or southern blight is sometimes seriously troublesome upon stake tomatoes and especially during dry seasons. It attacks the fruit at the blossom end, causing hard, dry discolorations which extend wholly or partially through the fruit. No effective remedy is known for this disease. It is less troublesome during seasons of abundant rainfall. Thorough cultivation by means of which the moisture may be conserved and made available for plant growth, together with irrigation, will be partially successful in lessening the amount of trouble from this cause.

The varieties of tomatoes rapidly change, few enjoying a period of popularity longer than ten years. The leading varieties most widely under cultivation at the present time are the Earliana, Chalk's Jewel, June Pink, Globe, Stone, Matchless, Coreless, Beauty and Ponderosa. The Stone is perhaps the leading variety grown for canning purposes.

The Ponderosa is rarely grown in a commercial way, but is a favorite among home gardeners on account of its extreme large size and solid fruit.

TURNIP

Two types of turnips are extensively cultivated—the Flat Dutch or white type and the yellow or Swiss type. Both types are grown for their roots, and while they enjoy a comparatively wide distribution they are of relatively little commercial importance. They are extensively grown in some sections as a stock food and in a limited way one or the other is to be found in almost every garden. The small returns commonly received from the turnip

rarely justify its being grown as a special crop by itself. It is almost universally grown as a catch crop after some earlier and more profitable crop has come off the land. The turnip frequently follows early potatoes, early cabbage, or early beets. It is grown chiefly as a fall crop, but is sometimes sown early to be harvested and sold in the bunch form during early summer and handled in the same way as beets or radishes.

The turnip requries a cool, moist climate, and, therefore fits into autumn conditions very well in most localities. It is comparatively hardy so far as frosts are concerned, and will continue to grow until severe freezing weather.

Any soil producing good crops of potatoes, cabbage or beets will produce good turnips. The soil is rarely ever fertilized directly for this plant.

Seeding is usually done by broadcasting over the thoroughly fined and well-prepared soils after former crops have been removed. About the first of July is the normal season for sowing the seed in the North. From six to ten weeks are required for maturity under normal conditions. Special care should be taken to avoid overseeding. It is a common practice to mix the seed with ashes, road dust or other similar material in broadcasting. The seeds should be covered by light raking after sowing.

When grown as an early spring crop it is common to sow them in drills and cultivate as with beets. The fall crop should be removed from the soil before severe freezing occurs. They may be stored as already described for potatoes and other root crops.

The rutabagas or Swiss turnips are similar to the white type in their climatic and soil requirements. They require a longer season, however, and should be sown at least a month or six weeks earlier than

the Dutch varieties. They are more frequently sown in drills and given some cultivation in order to keep down the weeds during the longer season required for growth. They are much richer in food value than the white turnips and are becoming more popular and in greater demand in many markets.

The club root and cabbage root maggot, common diseases of the cabbage, are frequently very destructive to the turnip. Rotation of crops is the only practical method of control. Turnips should never be planted after other cruciferous crops.

WATERMELON

In many respects the watermelon is the most important plant of the cucumber family cultivated in America. It is an important commercial crop in practically all the southern states and may be grown successfully in a limited way in every state of the Union. Georgia and Texas lead all others in the production of this crop. The use of the watermelon is confined almost entirely to human consumption, and has no by-products. The watermelon thrives best in the long seasons of the South, where the days and nights are hot and where frost seldom interferes with its development from the time the young plants are through the ground until the fruit is harvested. The watermelon is more sensitive to cold than any other member of the cucumber family.

A sandy soil is everywhere considered the ideal one, although the well-drained, alluvial river bottom lands are extensively planted. In the preparation of the soil it should be plowed to a medium depth early in the season and frequently stirred until planting time. It is hardly possible

to give too much tillage before planting. It is always considered a good practice to plow under a crop of vetch, cow peas, or soy beans in preparation for the melon crop. Such a plan increases the organic matter in the soil as well as the nitrogen content. The watermelon, like all other plants of its family, is a heavy feeder and requires an abundance of available plant food.

The hills should be planted from eight to twelve feet apart each way in check rows. A hole should be made at the point where the hill is to be located and a shovelful or two of well-rotted compost placed in the bottom. A complete fertilizer should also be used, analyzing approximately 3-8-10 or 3-6-8. This should be mixed with the soil at the rate of about one-half pound to the hill or applied with a drill over the entire surface before planting. Care should be taken that this fertilizer is thoroughly stirred and incorporated with the soil, otherwise serious injury may be done to germinating plants.

An abundance of seed should be planted in order that there may be a sufficient number of plants to withstand the attacks of the cucumber beetle. From 15 to 20 seeds per hill will not be too many. Seeds should be placed about 1½ inches deep. It is a common practice to plant one-half the seed at one time and the rest a week or ten days later. When the plants begin to form three or four leaves, they should be thinned to three or four plants to the hill, and if not showing a rapid growth at this time should be treated with a light dressing of nitrate of soda. Constant cultivation with the horse cultivators and the hoe should be kept up until the vines begin to run. Some weed growth late in the season is not generally considered detrimental as it shades the fruit somewhat. Sometimes soy beans

or cowpeas will be scattered over the soil at the last cultivation to serve this purpose.

It is very important in marketing that the melons be gathered at the right degree of ripeness. More or less difficulty is experienced by the uninitiated in determining this condition. The thumping method so generally advocated is perhaps the most reliable test after all, yet different varieties respond very differently to this particular test. After some experience in the fields, with occasional cutting, there should be little excuse for green melons finding their way to market. The methods by which the experienced man will surely pick the ripe fruits are difficult to describe, but few mistakes will be made. The well-ripened fruit should give forth a somewhat hollowed and distinctly muffled ring when snapped with the finger. Melons with a springy, leathery feel should be avoided. Watermelons are extremely heavy and bulky and cannot be profitably shipped by express or in broken car lots. Few melons are shipped until ripe in sufficient quantities to permit of car lot shipments.

The varieties commonly grown in the principal watermelon-growing districts are Georgia Rattlesnake, Kleckley, Florida Favorite, Kolb's Gem and Pride of Georgia.

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