Success in Market Gardening

and

Vegetable Growers Manual

by

W. W. Rawson
Success in Market Gardening,

and

Vegetable Growers' Manual.


Illustrated.

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PREFACE.

In view of the rapid changes and improvements in varieties and modes of culture which continually appear, it must be evident that the practical rules of Market Gardening need to be frequently revised and brought down to date. And any Manual on this subject, to be of practical value to the reader, must include many important directions not hitherto found in works of this class. No treatise within our knowledge has appeared during the last nine years that has aimed at covering the field with any approach to completeness; and, moreover, so far as we are aware no book has ever been written that is fully adapted to the latitude of New England.

I have been brought up in the business of Market Gardening. My father followed it before me, and, being led to it both by circumstances and inclination, I naturally took it up. I must have had a strong predilection for the work or I should not have followed it, as I have, continuously until now. I can now point
Preface.

back to a successful business experience of twenty-four years. So far as I am aware no market gardener in Massachusetts or New England employs a larger capital or sends to market a larger annual product.

The extent of my establishment and operations at Arlington has attracted general public notice. Men who have already embarked in the business, and have themselves been more or less successful in it, will find in this book the means of comparing their own methods with mine. Young men who are about to choose their avocation, and who have heard of the increasing extent and importance of this business of Vegetable Growing, will find here facts collected from a long experience, which can hardly fail to be valuable to an attentive reader.

A reasonable man will estimate the worth of this book by what it contains—not criticising it for the absence of matters which lie beyond its scope and purpose. In the introductory remarks with which it opens, I have endeavored to explain my object with sufficient precision, and throughout the preparation of the work I have aimed to outdo; rather than come short of, the promise held forth in the opening chapter.

W. W. R.

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PART I.

On the Growing of Crops in General.
Success in Market Gardening.

CHAPTER I.

Introductory Remarks—Location and Soils—Land Drainage—Irrigation of Crops.

Market gardening as a business has some peculiar features in which it differs from other branches of agriculture. Many people have an impression that the growing of vegetables for market is like any ordinary farming, and are disposed to believe that any person who can plough, hoe, and dig can grow one crop as well as another. Such people would find themselves sadly mistaken if they should undertake the business themselves and actually attempt to carry it on equipped with only a general knowledge of ordinary farm work.

Market gardening is made up of details; and, while each separate step may be easy of mastery by those who have a natural taste for the business, the whole art and a full comprehension of it can be acquired only by actual experience in the work and thorough practical acquaintance with all the minor points.

Therefore we desire every one to understand at the outset that a book on the subject, no matter how complete, can be only a helper, and a partial guide
towards the desired knowledge. In other words, the rules that can be laid down on paper, however explicit they may be made, will never educate a man to be a successful gardener, unless he is himself naturally adapted to the business, and is willing to do his part by personally devoting himself to the work, in all its details, as it goes along.

And so in writing the cultural directions for the different crops, I do not expect to be explicit enough to enable a mere novice, with no knowledge whatever of the subject, to achieve a success in gardening the first year. This would be impossible for me to do, were I to attempt it—which I do not. Even should I set down the most minute particulars and details, there would be very few cases where one could carry them out to the letter, as culture and treatment must necessarily vary according to soil and locality.

But my aim is simply this: by writing out practical directions and descriptions, gathered from my own experience, to enable any one, already in some degree familiar with the work, to cultivate successfully the various crops enumerated; provided his land and location are adapted to them. I propose to give my readers, as far as possible, the benefit of my own practical experience, and the methods of a success in business which has been gained only by years of close application and hard work.

In the following pages, I shall discuss at more or less length all the different products of the market garden; and some of the coarser crops, belonging rather to the "farm garden," or even to the farm, will
Choice of a Location.

be incidentally treated of. In so doing, I shall go through the whole series in alphabetical order, in order that the reader may the more readily turn to the information he is seeking. I propose to devote space most liberally to the most important crops. A chapter on Farm Implements and other supplementary matter will conclude the work.

But there are certain conditions essential to all crops. Some of the most essential requirements of high cultivation, and even of the most ordinary soil-culture, are often misconceived or overlooked, to a serious extent. For which reason it seems best, before proceeding to particular directions for particular crops, to treat, as fully as space will permit, of these general and very essential matters.

Location and Soils.

In seeking a good location for a market garden, of course the first point to be taken into consideration is the necessity of being near some good market.

And, right here, we would say that the largest cities do not always offer the greatest inducements to beginners. There are hundreds of wide-awake towns all over the country which will furnish a good, though limited, market for men who are able to work up a trade.

In these smaller towns, producers will often be enabled to realize better prices than in metropolitan markets, both from the fact that there is less competition to meet, and also because the purchasers there found will be likely to look more to the quality, and less to the cheapness, of the article offered, than those resorting to the city markets.
As we have mentioned, nearness to market is an important point, but the character of the soil and the lay of the land are of importance almost as vital as location. Of course, for a variety of crops, the land should be varied in character. But such variety cannot always be obtained, so that many are confined to one or two distinct kinds of soil, and in such cases find themselves limited to such few crops as are particularly adapted to their land and location.

Rocky ground is of course and by all means to be avoided for garden crops, in view of the deep and uniform cultivation they need to receive. And low lands which require under-draining are adapted only to certain special crops, and involve heavy outlays to make them capable of profitable culture. Preferably to either, a sandy loam with a sandy or gravelly subsoil should be selected. Such land is far better than soils resting on clay, not only because its nature is warmer, but because it is naturally well drained. A clay subsoil, at least until deep drains have been sunk and operated a considerable time, will render any land cold, as it retains the moisture.

If one can have his choice as regards the lay of his land, gently rolling or undulating slopes with a general eastern or southern exposure should by all means be selected. This will make more difference than some might imagine; as a northern or western slope is not nearly so soon affected by the genial spring influences as a more sunny location.

The difference between a northern and a southern slope often amounts to one crop a year; for on the
sunny side of a rise of land the soil can be worked in the spring so much earlier that, by right calculation, two crops a year can be grown, the first of which can be planted earlier—and the second can actually be harvested sooner—than the one crop raised on a northern slope.

Sloping land has still another advantage, almost equally desirable with that derived from having the right exposure, consisting in the facility it affords for irrigation. If a water supply can be brought to and stored in a tank, constructed on a natural elevation within the area to be irrigated, the slopes of course furnish the most convenient means possible for its distribution to the crops. And if the location is fortunately near a large pond, or unfailing brook, the privilege of access to such a water supply would very greatly increase the real value of the land for every sort of cultivation.

It should be noticed that some ground which in its native condition is quite incapable of bearing good crops has yet a superior natural capacity, that may be developed by skilful handling and liberal expenditure. This is especially true of lands lying on a retentive subsoil, and such lands, after some years of thorough draining and deep tilth, will show admirable results. In treating of drainage, we shall endeavor to make it clear how such a course of culture operates to mellow and warm the cold, barren soils, and bring them into high condition. In fact—having a good exposure to begin with—by drainage, deep tilth, generous and judicious manuring, and irrigation as required, the most
barren spot on earth can be made as highly productive as any other soil, even the richest. It is only a question of time and expense. Accordingly it has been said, not without some truth, that after all the chief matter in choosing a location is its convenience to markets of sale and supply; because if the soil be never so unfavorable the owner can make it over to suit himself, while if he is remote from market he can do nothing to help himself as regards that difficulty. All these considerations have weight, and must be duly allowed for; but the point I desire most to insist upon is the advantages possessed by the loams lying on sandy or gravelly subsoils, in their excellent natural drainage, and in being easy of cultivation.

**Land Drainage.**

Land, Soil, or Agricultural Drainage is a topic already touched upon, because inevitably presenting itself in connection with the choice of a proper location; but it is quite too large a subject to be dismissed with a brief and merely casual mention.

In selecting a location for either market gardening or farming, it is preferable, as we have said, to secure land that is *naturally* well drained. By this description we designate a soil which, owing to inclination of surface, or from having a porous subsoil, lets the water pass off quickly after a heavy rainfall, and which therefore stands in no need of artificial drainage. But it is not always possible to secure such a location, and in many cases artificial drainage is the only means by
which the best of farming land can be brought under cultivation.

It would be impossible in a volume of this size, even if wholly devoted to the topic, to give a complete description, with all details of methods and materials employed, for constructing the tile drains now in general use. We can only hope to give a few detached suggestions on the subject, such as may be of benefit to our readers in improving waste land, and in rendering heavy, soggy fields more tillable, and turning to account their natural fertility.

Amongst all the various ways of constructing permanent drains— with stone, brush, square and sole tile, etc.—it has become the well established general opinion that well-burned round tiles, with collars, if well laid, form the best. And in the long run they also prove the cheapest; although at first more expensive than some other devices.

Cobble-stone drains, such as in some localities are largely used in place of tile, are, when properly laid, actually more costly. And still more objectionable is the fact that, although in some instances they may last a long time and prove quite serviceable, they are always liable to be reached by surface water, which, by carrying silt into them, stops them up, and of course renders them useless.

The general principles to be observed in laying a stone drain are quite well understood. But a mistake is often made by lack of diligence in securing proper covering, and especially by resorting to the use of turf, which is often dumped in upon the stones, and which,
when decayed, forms the most effective possible material for obstructing the drain.

There are many ways of constructing cheap drains of brush, slabs, poles, etc., but they are sure to clog up and create trouble sooner or later; and, as we have said before, the round tile when well laid, generally speaking, forms the cheapest and most satisfactory means of draining.

In planning for the draining of a field, the chiefly important item is to take notice of the lowest point; at which the outlet must be formed. If a natural watercourse can be found near by, as much as four or five feet lower than the lowest surface of the field, it will be a great saving, both as regards expense and trouble. The ditch by which the water is carried from the outlet must be of sufficient capacity to serve its purpose at all times and seasons in a thoroughly adequate manner.

The laying out of mains, sub-mains, and laterals must depend wholly upon the character and condition of the land. More skill is required to lay out properly a complicated system of drains than to conduct any other branch of the gardener's work; and the designing of it is a more puzzling matter than people generally realize, until they have had some experience in it.

In the brief space which we can give to the subject it is impossible to describe minutely the methods of mapping out such a system; and we cannot do better, therefore, than to refer our readers to George E. Waring, Jr.'s able work on "Draining for Profit and Draining for Health," which is the most complete
work on this subject with which we are acquainted. Any one who has even a moderate amount of this class of improvements in contemplation ought by all means to possess a copy of the above named book, and make himself master of its contents by careful and diligent study.

The author recommends a general depth of four feet for drains; never admitting a less depth unless where an outlet at that depth cannot be obtained, or where ground is underlaid by rock. There is a general concurrence of opinion amongst those who have most carefully examined the subject, favoring this rule for the least depth. At intermediate points occurring between such (minimum) depths, the depth must be often greater, because the drain must slope uniformly from point to point, while the land does not.

As regards the distance between the drains, there is a difference of opinion, in fact this is a question which does not admit of any exact or definite solution, as it obviously depends in a great degree upon the peculiar constitution of the soil, which is variable; and, moreover, no amount of practical experience even will afford data for reducing practice to any well-grounded theoretical rule. It is not feasible to state, in exact terms, precisely what is the operation of these subterranean drains upon the moisture of the soil; but an idea sufficiently definite for all practical purposes may be gathered from experience.

In tolerably porous soils, forty or even fifty feet apart is generally conceded to be sufficiently near for four-foot drains. But for the more retentive clays, all
distances from eighteen feet to fifty have been recommended. The feeling grows more in favor of the greater width, from continued observation of the successful working of drains so placed. Still the author's opinion, formed from over twenty years of personal experience and observation of such works, and with due consideration of views published by others, is that we should hardly ever, where a soil needs draining at all, leave widths exceeding forty feet.

He further says that, in the lighter loams, there has been good success in following Prof. Mapes' rule: that "three-foot drains should be placed twenty feet apart, and for each additional foot in depth the distance may be doubled. For instance, four-foot drains may be forty feet apart, and five-foot drains eighty feet apart." But with reference to this greater distance,—eighty feet,—it is not to be recommended in stiff clays for any depth of drain. When it is necessary, on account of underlying rock or by reason of insufficient fall, to go only three feet deep, the drains should be as near together as twenty feet.

No great exactness can be had in such a matter as this. In consideration of the variety of soils, and our inability to measure the exact amount of water to be drawn off (which is never a constant quantity), or even the rate at which it may reach the drains by percolation through any given soil, uniform depths and distances cannot of course be prescribed with any pretence to theoretical precision. A general judgment made up from experience and observation is all that can be offered.
For explanation of the beneficial influences of draining, we must endeavor to realize some of the conditions of plant life. One of these is moisture at the roots. If drainage were attended by a complete withdrawal of all the permanent moisture of the soil, no one would be its advocate. Some imagine that wherever executed it is to the detriment of the land's capacity for production, though increasing its capacity for being cultivated. They say "more tillable is not more fertile. Tile draining is a craze. Wholesale rules without discrimination are a curse. Drained lands are not invariably better than the same lands undrained," etc.

But we maintain that in all soils not naturally well-drained (and so not requiring it) draining does as much good by promoting moisture during periods of drought, as by removal of the surplus water, which would otherwise destroy the productive capacity of the land. This is due to the fact that the deeper tilth and pulverization of the drained lands enable them to hold in saturation, as water is held in a sponge, valuable stores of water to be given off a little at a time, as needed, and also to draw up from below, by capillary attraction, similar timely supplies—while all excess and surplus is promptly gotten rid of.

A recently published work by A. N. Cole contains suggestions of interest in this connection. We have suggested that the most perfect drainage does not aim at a complete withdrawal of all the moisture; water is essential to plant life, but the land must not be drowned with water. Air and water both must be presented to the feeding roots. He says, "tilled land
being porous, the air forces its way into the crevices, and the water (of rains) passes through it from above. We will suppose that the water comes to a stratum that is impervious to its onward course. What happens? Simply this: it dams up slowly, inch by inch, forcing out the air as it rises. All motion and circulation is stopped. Fermentation and decomposition soon begin. The earth is drowned out—suffocated—dead for want of air. Water is good for the ground? Yes; but not in this way. The water must be moving constantly. There must be a current of air and water, and not too much or too little of the latter."

The processes of pulverization, which will be described under the title "Preparation of Soil," are such as to provide for the admission of the air. We shall now consider, in the remainder of the present chapter, by what means we may supply the needful amount of the other indispensable element, water. By drainage we provide for the removal of a surplus, whether from rains or springs; our next care must be for supply and distribution of a quantity adequate, in the longest and severest droughts, to the exacting needs of the growing crops. This supply and distribution constitute what is intended by the term "Irrigation."

Irrigation of Crops.

Artificial watering, especially as now conducted, forms perhaps one of the most important subjects that we could write upon. All vegetables are composed largely of water, some containing more than 75 per cent. A single hill of cucumbers, as has been said,
will drink half a barreful of water in three days' time, and, having done so, will begin languishing for lack of moisture, and die in a week. According to Dr. J. H. Gilbert, for every ton of dry substance grown, in an average crop, an amount of water equivalent to three inches of rain is exhaled in the process; which amounts to about two hundred times the weight of the vegetable product. And Sir J. B. Lawes arrived at substantially the same result by his own researches, separately prosecuted. Hence it will be readily seen that, unless there is moisture enough when the crop requires it, there will be a shortage in the harvest.

What is commonly called an "impoverished soil," or one considered naturally unfertile, may be in fact good enough in itself, its only deficiency being in the matter of moisture. We often see a poor piece of land yielding a good crop in a wet season; and artificial watering on the grand scale has, in many well known instances in Colorado, California, and elsewhere, both at home and abroad, converted absolute deserts into productive grain farms and fruit and cattle ranches.

Although the rainfall during each year averages about the same now as in former periods, the seasons are changing in this respect: that the rainfall is not so evenly divided, and we get longer and more protracted droughts; not relieved by the fact that the rainfalls, when they do come, are heavier. For this reason the subject of irrigation is constantly gaining in importance. It involves questions, both in regard to the supply of water and the manner of applying it. Of
course there are many cases where land is not located so as to be easily irrigated. Whatever the location is, no matter if quite favorable, it will require careful management in laying out the rows and planting the crops, to secure a plan which will allow of irrigating to the best advantage. The rows should always run up and down the slope of ground, and more or less obliquely if the ground is at all steep (instead of crossway), so as to allow of watering in the furrow; which is the proper way, as the moisture is required to be applied to the roots and not the foliage.

There are very few market gardeners at the present time who have adequate facilities for supplying themselves with water for irrigation, and it can only be secured, ordinarily, at a great expense.

Although many places are located near towns or cities which have a public water supply, they cannot be allowed to draw from the supply in such large quantities as are required for purposes of irrigation; as the need would come at a time when the water was the lowest in the reservoir, and was most in demand for other purposes. It is therefore necessary that the land to be irrigated should either be located near a pond, lake, or stream, or else supplied by an under current of water that may be reached by a driven well.

After a sufficient supply of water is found, the method of raising it to a proper height for distribution is by the use either of steam-pumps or windmills, or both. A tank or reservoir of the largest attainable capacity must also be provided, for the purpose of storing the water so raised until it can be properly dis-
Expense of Fitting Up.

tributed to the crops. Where windmills are used, for obvious reasons, the storage capacity must be greater than where steam-pumps are employed. This may amount to a considerable addition to the first cost; but, on the other hand, the cost of steam-pump and boiler is somewhat greater, and the running expenses considerably so. There are incidental advantages attending the use of steam which may be of great importance. The preference must depend upon the circumstances of one's situation.

The expense of fitting up any such arrangement for irrigating a market garden is so great that most gardeners think that they cannot afford it. Even for a small piece of a few acres, the cost would be at least from $2,000 to $3,000; on a larger place, a much greater amount. If one has not the means to pay for these facilities, and does not feel warranted in going into debt for what he wants, of course he must do without them, and depend on transient waterings from summer showers. But it becomes more and more evident every year that such a course will ruin the man who follows it. The ill effects of the increasing irregularity of the rainfall are mitigated, it is true, by deeper ploughing and the construction of drainage works, but all crops (some more than others), in addition to every other aid that can be given them, will need besides, at certain times, abundant watering. Even in the most favorable seasons, resort must be had to artificial watering, at intervals, to secure the growing and maturing of a crop such as to give satisfaction, and reward the gardener for his labor.
For about nine months of the year a windmill would furnish all the water required by a market garden, but during the other three months a steam-pump would be required in addition in order to furnish a sufficient supply for all seasons.

On a later page we shall present a cut of a compact and serviceable steam apparatus designed for pumping, under Deane's patent. It combines all the essential features needed for drawing water from the source of supply (well, spring, stream, pond, or tank), and forcing the water any distance and height to a point suitable for distributing it, by gravity, over the land to be irrigated; or, as sometimes practised, forcing it through pipes to hydrants, where hose can be used for further distribution. In some cases the hose may run directly from the pump. It is much more easily understood and managed than might be supposed, owing to the simplicity and compact style of its construction. It is claimed to be the simplest arrangement of the kind on the market, and such that any one of ordinary intelligence can learn to operate it in half a day.

The easiest and perhaps the best way of leading the water to various localities at will is by the use of rubber hose; this is cheaper than pipe, which is heavy, and very awkward to handle. At the present time it is easy to obtain rejected steam fire-engine hose which, although not strong enough to stand the pressure of the steam fire-engines, is amply strong enough to use for irrigating. There is seldom more than thirty pounds' pressure, as the water is not forced, but is allowed to run through the open hose. The amount
of land that can be irrigated by the use of a steam-pump in a day of twelve hours is about three acres. The expense would be about $10.00 per day, including the wear and tear of the pump, hose, etc., as it would take one man to run the pump and another to tend the hose, which, with cost of coal and various minor items, would foot up about the amount stated. It will be seen by the above figures that the direct cost of irrigating an acre of land once would be about $3.50. This is exclusive of interest on the original outlay. A suitable pump will throw one hundred gallons per minute; which, in a day of twelve hours, would be equivalent to covering three acres nearly one inch deep. This is much more than an average single rainfall; and certainly there is no acre of growing crops which, in a dry time, would not be benefited to an amount much more than $3.50, or even double that amount, by such an application of water. Many claim that watering by artificial means does not pay; but certainly, where water is available so that it can be applied in such ample quantity at the price thus indicated, it must be plain to every one that it will pay, and in many cases will earn many times the amount it costs. Oftentimes such a watering will save a crop which otherwise would have been a failure.

There is very seldom a season so wet that the steam-pump will not be required two or three weeks; and in most seasons it will be in use eight or ten weeks. When the weather is very dry, and all the crops need abundant watering, the pump should be kept running night and day, by employing two sets of men. It will
be economy to do this not only from the fact that a double supply is thus obtained, but because when the fire is allowed to go out at night it takes about an hour to get the pump to running again. By continuous running, time is saved at both ends of the day.

In applying the water to a field of cabbage or cauliflower, the rows being about three and a half feet apart, a plough is run between the rows, so as to make a furrow for the water to run in. It is a very easy matter to water a field where the land is on a slope, but where it is nearly level it is much more work; as the hose has to be frequently transferred to different points in order to water evenly.

In watering a field of celery a furrow is ploughed away from the plants, on each side of the row, at a distance of about one foot. The furrow is then filled with water; and as soon as this has soaked away the furrow is turned back again. An application of this kind once a week will prove sufficient even in the dryest time.

The crops which require the most water, and those which therefore are most benefited by irrigation, are cabbage, cauliflower, celery, lettuce, beets, cucumbers, horse-radish, and, in some cases, squashes.

The practice of irrigation in this manner has but lately been introduced, and on account of the great expense, the method described is used by only a very few, speaking comparatively. But too much cannot be said in favor of irrigation; and the use of windmills and steam-pumps is becoming more general. Their use will no doubt further increase as people learn more
of their value, and come to see the advantage of having a constant supply of water at hand, and thus becoming independent of the freaks of the weather in this particular.

In one instance, which was reported to the Massachusetts Horticultural Society, in a severe drought, a steam-pump was rigged, and the water of Mystic River was poured for seven days and nights upon a parched field, averaging 75,000 gallons per day, or a quantity equal to three inches over the entire surface, at a cost, including all expenses, of perhaps ten cents per 1,000 gallons.

Somewhat later, in 1884, the present writer had six acres planted with cauliflowers. This is a crop which does not show the effect of dry weather until about to head; when, if there is danger of a check, the application of water will cause them to go right on. That year the need was urgent, and he devoted his steam-pump to the work of supply — running it continuously for four weeks, with two men by day and two to relieve them at night. From these six acres he sold $3,500 worth of cauliflowers. If he had not irrigated them he would not, probably, have realized over $1,000 for his crop.

It will be manifest, upon reflection, that continuous light waterings are not what is desired. Water cannot, of course, be applied without reducing the temperature of the soil very materially, and thus occasioning, for the time, a condition unfavorable to the advance of the crop. This is a matter for serious consideration, in connection with many crops, especially in a
climate like ours. In the case of light waterings, frequently repeated, a larger proportion disappears by immediate evaporation, thus wasting work, and, moreover, by this excessive evaporation, still further and needlessly reducing the temperature of the soil. Liberal supplies at proper intervals are rather to be given, transferring the delivery from one section of the grounds to another, on successive days, and so continuing till it is time to resume the round. The proper intervals, in a time of drought, may be taken to be about one week, on the average,—though this must vary with the crop, the soil, the temperature, and the judgment of the cultivator. The same variation may be expected in estimating the amount of water necessary for one thorough irrigation. No general estimate on these points can be given that will be at all satisfactory, except merely as a rough rule for planning the scale of the works. In establishing such a system, no great nicety of calculation is likely to be of any value. The data already given, and the practical examples which have been cited, will enable any one, making due allowance for variations of circumstances, to arrive at a conclusion near enough for his purposes.
CHAPTER II.


A PROPER PREPARATION of the soil, prior to sowing or planting, is one of the most important conditions involved in the process of getting a crop. We shall not aim to discuss at length the principles on which it depends, but confine ourselves in the main to simple and practical directions as to the work to be done.

Ploughing, subsoiling, harrowing, raking, and (at some stage of the process) manuring,—these constitute the main operations by which the land, after being stripped of a crop, is put into condition to be planted with another.

For all market-garden crops we recommend that the ground be ploughed once before an application of manure is made. In the case of all leaf crops, like celery, cabbage, etc., eight inches would be a sufficient depth for this first ploughing, before the manure is applied. For the second ploughing, which is to turn the manure under, a depth of six inches would be sufficient, and preferable: so as to leave the manure as near the surface as possible, and still have it covered.

Then, if the land is lumpy or hard, a wheel harrow or some implement for breaking up the lumps should be
Market Gardening.

put to service. Lumpy, uneven ground, or coarse soil will never do to plant in: seeds will not catch uniformly or grow well in it; the plants will lack uniformity, and will not mature together. The importance of this matter is too generally underrated; very few people have anything like an adequate idea of it. If the ground is to be devoted to raising greens, or some sowed crop where a drill is to be employed, a Meeker harrow will smooth the surface nicely, so that the seed-sower will do its work to satisfaction. A full description of its operation may be found in the chapter treating of Farming Implements.

This harrow will prepare the surface sufficiently well for such crops as onions, cabbages, or beets, and for spinach and other sorts of greens; but for such small fine seeds as those of lettuce, or dandelion, the hand rake must be brought into service.

For root crops, at the first ploughing a depth of twelve inches would be none too much. In ploughing for deep-rooted crops, like parsnips, long carrots, or horseradish, the second ploughing should be of eight inches' depth; and this should be followed by a "sub-soil," after which use the Meeker harrow or leveller, as already directed.

After ploughing and harrowing, it is often advisable to pass the roller over the land. The horse roller is a very useful article, and is used very extensively. When the ground has been harrowed, and the lumps not yet broken are brought to the surface, the roller is put on to crush and smooth them out. It is also very beneficial on light land, in dry weather, to help the land to
retain a sufficient quantity of moisture. I have found the use of a good horse roller to be of great advantage, both in breaking up and pulverizing lumpy land, and in firming down soil that has been thrown up very lightly during previous preparation. Such soil, until again compacted, is prone to become excessively dry: a result which is obviated by use of the roller. The top should be perfectly dry before rolling, in order to obtain the desired effect.

We have already alluded to subsoiling, and wish to remark here that the subsoil plough is a valuable, indeed, an indispensably necessary implement, and should be invariably put to use in the preparation of the ground for all root crops. The subsoil should follow after the land-side plough, in the same furrow, and go down to a depth of fifteen or eighteen inches. It usually takes two horses, as the larger sizes of ploughs do; and it is even harder for the team than common ploughing. There are small subsoilers which can be used with one horse; but if the land requires subsoiling at all, it is better economy to use the larger size and do the work more thoroughly.

In the concluding chapter, relating to Farm Implements, a sufficient description will be given of the different ploughs that are likely to be required, both land-side and subsoil. At this point I wish to call attention to the great importance of keeping them always clean and bright. Never allow the ploughman to put his plough away with any dirt upon it. It is the sure mark of a poor ploughman, when his plough is covered with dirt, and goes through the land like a stick.
In fact, there are but very few good ploughmen to be had, and any employer is fortunate if he gets one. Many men will call themselves good at ploughing; but the men who really understand it, and do it as it should be done, are very scarce. When such a man is found, he should be kept on the place, if possible.

In ploughing land for the different crops, some plough about the same depth for everything; but the depth ought to be varied so as to suit the crop. For instance: all root crops should be ploughed from ten to twelve inches; while, for vine crops, six inches would be quite sufficient. Many take, in all cases, all they can to the furrow, making it, say, twelve or fourteen inches wide; but where the land is ploughed twelve inches deep, and a coat of manure is turned under at the same time, eight inches is wide enough to turn the furrow. In a "first-time" ploughing, of six inches deep, with no manure to turn under, twelve or fourteen inches may be taken at each furrow. Always plough all the land once in the fall and twice in the spring, but never when it is wet. Soil that is worked when very wet, except sometimes a very sandy piece, will scarcely recover from it for a whole season.

The purpose of the fall ploughing will be most completely accomplished by leaving the land in clods and rough, loose ridges, for the frost to operate upon during the winter. The greater the surface thus exposed to the influence of the atmosphere and changes of weather, the better for the soil and the coming season's crops. Moreover, late turning over the ground is an effectual means of killing off the larvae of the May beetle, the
pestilent white grub, and other larvae of insects. Being disturbed from their winter quarters, they are to a great extent destroyed by exposure to the cold and air.

In the case of sod land to be prepared for tilled crops, there is a manifest advantage in turning it earlier in the season, so as to hasten the decay of the turf; but with land already under cultivation the case is entirely different, and the later it can be done the better.

It is, of course, assumed that everything necessary to a perfect drainage has been done prior to the process of preparation here described. Wherever the water has been extracted by drainage, it leaves a moderate moisture in the soil (until withdrawn by evaporation or taken up by the crop), which is exactly the condition most favorable to vegetation. The various processes of preparation, and later cultivation, are directed more especially to the maintenance of this condition.

The ground should be finely pulverized both at and below the surface, encouraging the roots to strike downwards and below the immediate influence of the hot sun. The air entering through the fine interstices of the soil condenses its latent moisture upon the cooler portions beneath the surface; thus contributing materially to the desired moisture, and also aiding the chemical changes attendant upon plant growth.

Another very important result of thorough and deep pulverization is the capacity afforded to the soil of directly absorbing and holding rain-water which otherwise would flow off wastefully, if not destructively, on the surface. Any one can see for himself the contrast
between a soil which has received this thorough tilth, and one which has not; the latter looks well enough early in the season, but is burned up when the summer heats begin; while the deep-tilled land, on the contrary, holds the moisture like a damp sponge, down below the reach of the sun; and its presence there is plainly visible in the crop.

Laying Out Land for Crops.

A careful and definite plan, to be adhered to with as much strictness as the nature of the case will admit, is essentially necessary at the very outset of operations. If one is well acquainted with the land he is cultivating, and knows what crops have been grown on each portion of it the previous season, of course he can make his plans accordingly. But if it be the first season of his occupation his arrangements must of necessity be guided by such information as he has. In that case, they will be partly experimental, and changes will be from time to time inevitably incurred; but this disadvantage should be avoided as far as careful attention to the subject will enable him.

It is a good idea, when practicable, to have a plan of the garden on paper, and to have this made during the winter; so that the intended arrangement of crops can be mapped out for the coming season. This will, of course, be a convenient guide in placing the manure for each crop at the point where it is to be used, in procuring supplies of seed, and also in many other details.

In mapping out a field in this manner, a person must
of course understand the rotation, or succession, of crops, in order to do the mapping intelligently; and accordingly we shall proceed to consider this subject next in order.

Rotation of Crops.

The right succession of crops for enabling the cultivator to obtain paying results, both in the harvests to be gathered first and in condition of the soil for further culture, has always been a subject of much importance to every tiller of the soil: and is also interesting from a scientific point of view.

The difference between the old style of summer fallowing and the present well understood plans of rotation is so considerable that the two ways are styled by some the "old" and "new" agricultures.

Under the old system, an occasional year of fallowing was relied upon to rest the ground and renew the plant food in the soil, so that in the succeeding year a larger yield could be obtained than if the land had been cropped continuously.

Fallowing, although of benefit in some respects, is wasteful in two ways. The land of course is yielding no income in the idle year; here there is a loss of interest on capital. And then, too, as I am persuaded, there is always more or less waste and loss of plant food going on from any soil that is left exposed to the sun and rain during the summer months. At least two and often three crops in a year with constant tilth (including, with other benefits to the soil, the suppression of all weeds and wild growth) represent the "new" method. It is
decidedly in contrast with the old at all points—and seems at all points to have the advantage of it.

The correct theory of rotation proposes, while making immediate use of the plant food already in the soil, at the same time to prepare the soil for producing the other crops that are next to follow. In arranging for a system of rotation, we should aim to grow such crops and under such culture as will keep the soil well supplied with humus, or plant food.

No exact rules can be laid down as to the order in which crops should be planted in rotation, but it should be remembered that some plants by nature feed near the surface (like corn, for instance), while others, take clover for an example, draw the most of their nourishment from deep down in the soil.

The object should be always to avoid following one deep-rooted crop by a similar one; taking great care to alternate them with others as constantly as possible. It is well, when practicable, to follow a slow-growing crop with one of quick growth, or vice versa. No root crop should follow one of a similar character; nor should vines follow vines. Alternation is always beneficial. Onions are very generally regarded as an exception to this general rule, and to some extent they doubtless are so; but I have not found it advisable to grow them on the same ground many consecutive years, as they are far more likely to become maggotty, and otherwise diseased, than when the ground is changed once in two or three seasons.

There is considerable truth in the suggestion that a good rotation can only be had when conducted by
Manures and Fertilizers.

competent management, as hinted in the following extract from Wilmer Atkinson: "The rotation that is wanted is the one that will rotate most fertility into the farm and most cash into the pocket. Differing soils, differing advantages or disadvantages of markets, differing degrees of knowledge and experience in the growing and handling of certain crops are among the many elements that enter into the question. In any case, it must be the one that will yield the largest amount of sale product, with which to meet current expenses of business and living, and at the same time store increase of fertility in the land for future use."

Just what this is appears to him a doubtful question, quite too intricate to be discussed, and on which it would be quite impracticable for one farmer to advise another. On the contrary, we hold that accumulated experience has settled many points in a way not likely to be reversed, and affords much valuable aid in promoting the objects on which all are agreed, viz.: immediate cash returns and future productiveness of the soil.

The subject of the judicious succession of crops will be repeatedly reverted to, and illustrated by many practical examples, fully explained. These will be found in the cultural directions which accompany our descriptions of the different vegetables, hereafter given in this book.

Manures and Fertilizers.

The provision, preparation, and use of manures and fertilizers is one of the most important and diversified
subjects in the whole business of market gardening; and to cover these points advantageously and economically involves a very considerable amount both of thought and labor.

In my own practice, the dressing that is usually supplied per acre for growing the two or three crops which it is customary to obtain each year from garden land consists of from twenty to twenty-five cords of well decomposed stable manure, put on broadcast.

The manner of applying depends somewhat on the crop; and many special instructions will be given in the cultural directions which are furnished with our descriptions of various vegetables. In general, however, the manure is either spread in advance of the first ploughing, and then turned under, or is put on after the ground has been worked once, being then worked in with the second ploughing. The distribution of the manure is generally by the use of tip-carts, as there is no spreader now in use that will put on twenty cords per acre by once going over.

During the summer, fall, and winter, manure for the succeeding season is hauled out from the city. The sources of supply are the large stables, from which the accumulations of manure must be removed at brief intervals all through the year. It is usually piled in some place near where it is to be used. However, during the summer, it is my usual practice to put it into my cellars, and there let the hogs work it over until fall. This manure, so prepared, is, in my judgment, the best I have, and is used for growing cabbages as well as other vegetables; although many people
do not consider hog manure desirable for that crop.

In the beginning of the winter this is teamed out upon the fields where it is to be used; the cellar is then filled again, and its contents remain in it until spring. All the manure which is drawn from the city in the summer and fall is overhauled in the early winter, and is again worked over in the spring before applying it to the land. It will then be quite fine, and fitted for nourishing any kind of crop.

In distributing the manure, to put on twenty-five cords to the acre, reckoning four tip-cart loads to the cord, requires one hundred loads; making three piles to the load, we shall have piles twelve feet apart each way. In applying twenty cords to the acre, still reckoning four tip-cart loads to the cord and three piles to the load, we shall have piles twelve by fifteen feet apart. In applying fifteen cords to the acre, with loads and piles as before, we shall have piles sixteen by fifteen feet apart.

This last named amount is one which is seldom used in a market garden, except where one crop is to occupy the ground through the whole season. Where two crops are to be grown with one application of manure, the second amount is the one to be used: and where three are to be grown, use the first named amount.

It is very wasteful to expose manure unnecessarily to sun and wind. Never spread manure one day to be ploughed in the next.

It may not be amiss to mention, lest its importance should be overlooked or under-estimated, the great advantage of taking care, in spreading the manure, to
do it evenly, and so that the heaps shall not be made to overlap. One heap is then made to join up to another, and the whole ground fares alike as regards the supply of manure. This seems obvious enough, and practical works on farming already have sought to enforce this view. But as we read in one recently published, "there is more in this point than is generally supposed by farmers, who, in many cases, are careless and wasteful in this respect, giving too much in some places and too little in others. The consequence is uneven growth over the different parts of the field; perhaps rank in some places, and in others a half-starved crop."

The same writer suggests another important point in spreading, which is to break up the lumps and scatter the manure about in a fine state; unless this is done the field cannot be evenly fertilized. There is work about this, and some hired men will neglect and avoid it if they are permitted, but it should not only be insisted upon, but looked after, and its faithful performance insured. Solid manure should never be allowed to ferment, either out-doors or under a cover, without the presence of absorbent material to take up the gases evolved during the process. This is the basis upon which the whole theory of com posts and management of the compost heaps is admitted to rest.

As already implied, it is necessary for green manure to undergo fermentation, in order to make its constituent elements available as plant food. Some good gardeners insist that all manure should be thoroughly fined before it goes upon the land; that none should
Use of Commercial Fertilizers.

be carried on that is not as fine as the soil upon which it is to be spread. It is undoubtedly advantageous to conform to this rule as far as is reasonably possible. However, green manure may be applied in the fall and covered in with the fall ploughing, in which case the fermentation, when it occurs, takes place within the soil, making it mellow and rich. At this stage, and until the warm weather of the following spring induces fermentation, there can be no waste of the manure by soakage of water, because it is still insoluble.

The case is different with fine compost, or with the ordinary pulverized commercial fertilizers, the benefit from which must be secured in a crop taken the same season or it may never be obtained.

In case three crops are to be grown and the third crop is to be cabbage or celery, the application of about one half ton of some good commercial fertilizer to each acre would be very beneficial. It should be put on when the third crop has made about half its growth. In many similar cases, guano, superphosphate, bone-dust, and the like may be used in combination with the stable manure already in the soil, with excellent results.

This use of commercial fertilizers in connection with stable manure has become quite common with market gardeners during the past few years. Some people even have an idea that, by the use of commercial fertilizers and without any other manuring, land can be kept in a proper state of fertility and condition to grow crops, year after year. Possibly this might at times be done, on some soils, and where only one crop each year was
to be produced; but in the market gardens where are grown several crops in a single season, maintaining a constant drain upon the nourishment afforded by the soil, such a plan would not be found to work well.

One reason for this is, that where two or three crops are to be grown during the season, the particular kind of fertilizer which would be required by one crop might be of little or no value to the others. And moreover, it would be a very difficult matter to apply, from time to time, sufficient quantities of commercial fertilizers to carry all the crops to maturity. But stable manure answers well for all crops, and so, if desired (though not always necessary or convenient), enough can be applied at the time of ploughing, in the spring, to carry all the crops through the season.

Green or composted stable manure, besides the increased store of plant food it directly provides for the growing crop, increasing its vigor, and enabling it to strike deeper, has no doubt a beneficial effect upon the mechanical condition or texture of the soil. This is not the case with the commercial fertilizers, which, if used without the stable manure as a corrective, in course of time make the land sodden and heavy. Thus it will be seen that, for various reasons, commercial fertilizers cannot wholly or even largely take the place of stable manure, while they are nevertheless much esteemed for use in combination with it. Since the use of commercial fertilizers has become general the price of stable manure has decreased; and while the convenience of procuring the former makes them more particularly convenient and valuable to the stock-feeding farmers (who
are generally remote from the city), their introduction has also been of much benefit to the gardeners near the large cities, in thus reducing the cost of stable manure. The price would be even lower than it is, were it not for the fact that large quantities are now shipped by the car-load from the cities to distant points, while but a few years ago no instance of the kind had ever occurred.

The old-fashioned privy-vault or cesspool is a source of supply once largely depended upon, but now only rarely met with; as the general extension of water-works to all the more compact centres of population, and even to isolated country houses, has caused a discontinuance of the earlier practice of allowing night-soil to accumulate, and depending upon intermittent removal by carts.

Still there is sometimes a case of this kind to be dealt with. The owner of the premises, if he has facilities, will generally prefer to compost his material on the spot, with a liberal proportion of light, dry loam, rendering it perfectly inoffensive. It is a highly stimulating fertilizer, and may be productive of excellent results if discreetly used. When the owner's object is simply to get rid of the contents of his vault, — although formerly this was accomplished by bailing into wagons specially built for the work (similar to the offal-wagons now used for collecting kitchen refuse) — it is found more convenient to use an ordinary (tight built) cart or wagon; in this, earth, chopped straw, ashes, street sweepings, or any other convenient absorbents are conveyed to the spot. With earth and
ashes a basin-shaped receptacle is formed on the ground adjacent to the cesspool, keeping a reserve at hand of absorbent material to be added by degrees as the work progresses. The vault is then bailed out into the space so provided, and, its contents being mixed with a due proportion of absorbents, and, finally, the earth around the edges being worked in, the whole mass is then ready to be loaded and transported.

By this method the material is made convenient to handle, and as little disagreeable as ordinary manure from the barnyard. In England, and on the Continent, by the use of long straw, judiciously disposed during the loading, the mixed material above described is built up into a stack reaching two or three feet high, above the sides of the wagon or cart, and so great loads of it are carried many miles without loss. The straw is spread so that half of its length projects over the sides or ends of the load, and in layers—the inner ends of the straw being covered and held fast by the alternate layers of compost—and the outer ends are then bent upwards and backwards, and similarly confined. Racks for sides and ends are convenient but when the load is carefully put together may be dispensed with.

Wood ashes, where they can be obtained, form one of the best of fertilizers, and when unleached are generally richer in potash (which is one of the most important elements) than most commercial fertilizers. From the fact that ashes are almost entirely lacking in nitrogen, it is not advisable to rely on them alone and
Manuring in the Hill— Composts.

continuously, year after year; but if applied about once in three years, with stable manure put on in the meantime, they will be found of great value. For cabbage and onions, which require a very large amount of potash, ashes are especially suitable.

For manuring in the hill, which is in many cases highly advantageous, it is ordinarily preferred to use guano, superphosphates, and the like, because of the facility with which they can be put in; care being always taken to stir them in well, so that the sprouting seeds shall escape absolute contact with the unmixed fertilizer—which would be destructive.

Good, ripe, well-worked compost is also employed; often made from materials specially purchased to mix up (like fish compost, made where fish-waste is readily procurable), but also produced, under judicious management, from every thing in the shape of decomposable material that can be gathered up about the place. And if due attention is given to collecting together all waste material—litter, leaves, weeds, and the like—and stacking them in alternate layers with fresh loam, or road-scrapings, the result will be a handsome lot of uniform, fine compost. It should always be built up in layers, each layer spread out so as to cover the preceding layer uniformly; which will secure compost of even quality. It should be protected from washing or leaching by a rough covering of boards, so placed as to shed the rains.

Occasional layers of fresh dung, doses of lime and ashes, and drenching the mass from time to time with liquid manure, will enable the proper fermentation.
There are innumerable ways of increasing the bulk and enhancing the quality of the compost heap, which can best be mastered by the study of any good manual on the subject; and we do not aim here at superseding any of these treatises. Our object is mainly to call attention to this means of utilizing all manner of decomposable trash, and converting it into valuable plant food. There is an old saying, that "anything that grows in one summer will decay before the next:" and this hint may be profitable as a guide in collecting vegetable matter for the compost heap.

The presence of the loam, or loamy mixtures, in the heap is quite important. It has been said that where sods, muck and weeds form a part of the mass, it is not alone the vegetable matter which has been brought in that constitutes a material addition; perhaps it is not even the principal one. There is always considerable earth adhering. "The fermentation, induced by the dung and liquid manure and the action of the lime or ashes added, works upon the earth adhering to the roots and forming a considerable part both of sods and muck; and develops an admirable quality of plant food." Hence this element of the compost heap, which is generally overlooked as unimportant, should never be wanting — instead of diluting, it in reality reinforces the other manurial elements.

Liquid manure is seldom at hand in large quantities, and not much advance has been made in using it directly upon the land under crop. When this is done, it should be in a very diluted state. Even if so much diluted that it seems to run perfectly clear, it may still
be found sufficiently strong; if too strong its use would be injurious rather than helpful, and might often destroy a crop entirely. There is far more danger of getting it too strong than of making it too weak. It may be doubted, indeed, whether the diluting element, water, is not, at least, an equal cause of the fertility which sometimes attends its use, when directly applied. The result either of watering or liquid manuring will be less favorable in a cool season than in a hot one; owing to the reduction of temperature occasioned by wet applications to the soil.

A way of procuring liquid manure—convenient when a small quantity only is required—is to leach solid stable manure as ashes are leached for obtaining lye. For special results, solutions of specific commercial fertilizers are valuable, and are easily made. For instance, liquid nitrate of soda is obtained by dissolving one pound of the nitrate in twelve gallons of water. It is beneficial to all garden crops, though particularly recommended for grass plots—but its chief value to the vegetable grower is as a destroyer of slugs and other garden pests.

The most valuable liquid manure is, however, the urine of stabled animals, which when not allowed to run to waste is ordinarily taken up by absorbents kept under the animals, in the stalls or in the cellar beneath them. Sometimes, however, it is conducted by natural flow in gutters and pipes to a tank from which it may be pumped. It is very valuable, more so than the solid excrement from the same animals; and more effectual means of saving and applying it than those
now generally practised will doubtless soon come into use. In applying it directly to the soil amongst growing plants it requires, as already said, to be greatly diluted. Small amounts pumped at intervals over the compost heap promote fermentation.

In purchasing manure, preference should be given to that of grain-fed animals. The value of all animal excrement depends more on the character of the food consumed than on the kind of animal. But it is convenient to know the average composition of the solid droppings of different animals, and the following data have recently appeared in the *Gardener's Monthly*. The excrement standing highest in value is sheep dung (this not being obtainable in our vicinity, we give its analysis merely for comparison). It contains in 100 parts, of water, 68.71; azotized matter, 23.16; saline, 8.13. Horse manure consists of water, 75.31; geine, or organic matter, 20.67; salts, 4.02. (The geine is composed of — carbon, 9.56; hydrogen, 1.26; oxygen, 9.31; and nitrogen 0.54.) Cow manure contains, geine, 15.45; salts, 0.95; water, 83.60. Contrary to the general idea, that of the horse outranks that of the cow.

The list of materials available to the gardener and cultivator for enriching the soil comprises the following principal items: the animal manures (like those whose analysis has been given), fish, bones of animals, lime, gypsum, wood ashes, common salt, soot, peat-earth, seaweeds, malt dust, rape-cake and linseed-cake, green succulent plants, and commercial fertilizers.

Much has recently been added to the stock of general information on the nature and action of manures.
All the more the subject is one which demands constant study and reflection on the part of the practical cultivator. In view of the great variety of conditions presenting themselves, it often seems next to impossible for him to select from the mass of available matter the points likely to be of assistance to him. Yet by diligent reading, and carefully discriminating what he reads, he will soon begin to feel the benefit of combining the experience of others with that which he gains for himself, and will find that the former is by far the less costly of the two. On this general topic of manures, many well written works may be found in most libraries. We recommend for reading, once and again, till its contents become thoroughly familiar, Harris' "Talks on Manures," published six or eight years ago. Its style is varied and interesting, and the matter is highly instructive. Every farmer should use this, or some equivalent book, as a constant reference and guide in providing and applying manures; and there is no other book that we know of which presents this subject so clearly and intelligibly, and at the same time in such an interesting manner—almost every page is as readable as a story.

Application of Manures.

Further general suggestions on this subject might seem to some almost unnecessary, but, nevertheless, this is an important part of market-garden work, and well worthy of attentive study. As garden crops, to be of marketable quality, require to be grown quickly, it is plainly requisite that the land be brought into the
best possible condition to begin with, and then that the artificial fertilizers or further manurings, whatever they may be, should be applied in such a way that the growing crops can readily reach and take up this supplementary nourishment.

In what has been said on Preparation of the Soil, we have included many detailed directions for applying manures to the soil, and amongst them have recommended having the land ploughed once in advance of the first application of the manure. This gives a chance for the manure (especially if it is a little coarse) to be worked into the soil more thoroughly by the second ploughing than it otherwise would. However, except in comparatively few instances, the presence of coarse manure is a serious impediment and disadvantage in the process of cultivation. It should be in a fine state, reduced to this condition by slowly conducted previous fermentation, and should be very thoroughly intermixed with the soil.

Of course, as already said, it is very important that market-garden crops be grown quickly, and right here is the reason why quick-growing crops require more manure than others that take a whole season to complete their growth: it is because the latter have more time in which to feel about and collect their necessary nourishment from the soil and atmosphere; but the former must have their food in abundance, and it must be placed within easy reach of the feeding roots, or there will be a most decided shortage in the result.

There are great differences in the requirements of the various crops, and no set rule can be given that
Fertilizing Land under Crop.

will be adapted for regulating the quantity of manure to be applied to all crops and on all soils. Some specific instructions for special cases appear in the following pages.

Where but one crop per year is to be taken from land which is already in fairly good condition, ten or twelve cords per acre of well decomposed manure would be considered, ordinarily, as a sufficient supply; but on land to be double-cropped, twenty cords would be none too much. This should be ploughed in lightly, so as to be left lying near the surface.

If the first ploughing should be done in the fall, the manure can be applied then, and remain lying out on the surface until spring, as it does not lose by so doing. During a dry season, unless the land can be properly irrigated or watered, a crop will manifestly be unable to draw the proper amount of nourishment from the soil, since all plant food of every description has to be not merely in a soluble form but actually in solution before it can be taken up and assimilated by the plants. For this reason it is becoming necessary, in view of the continually recurring droughts, to provide effectual means of irrigation.

Sometimes, however, a crop comes to a stand-still by reason of having exhausted all the fertilizing matter contained in the soil, of a sort available to its requirements; and in such instances the trained eye of the practical gardener can usually detect what is lacking for the crop; and he may supply the need by an application of some specific commercial fertilizer. It would be difficult to explain to a wholly unexperienced per-
son just how to detect the wants of the crops, but a little acquaintance with their normal habits of growth will speedily teach one what he needs to observe.

It is imperative, even in an economical view, where a crop is checked in growth from want of fertilizing matter, that some quick-acting fertilizer be promptly applied, for upon the question of a few dollars' expenditure at this crisis may depend all the difference between a crop and no crop. Whenever the need of such an application occurs, it is better to sow the fertilizer broadcast than to place it directly on the hill and about the plant; and the labor of applying it is less. Liquid manure may be applied by the process already described for irrigating, in a furrow opened about a foot from the row; more or less, according to the growth the plants have made.
CHAPTER III.

SELECTION OF SEEDS—THEIR VITALITY—SEED-GROWING—SOWING THE SEED—CULTIVATION OF CROPS—CONSTRUCTION AND CARE OF HOT-BEDS—GATHERING THE CROPS—CAPITAL AND LABOR INVOLVED.

Perhaps we might truthfully say that the most important of all points in gardening is the right selection of seeds; for without good seed the care and expense devoted to selecting and fitting the land, or procuring and using implements, fertilizers, etc., is all bestowed in vain.

By good seed, we not only mean such as will germinate properly, but such as is true to name, and of the very best selected strains. And it is proper in this connection to say that no one need expect to get seed such as we have spoken of at such absurdly low prices as much cheap stuff is sold for. Better to pay twice the market price for an article that is first-class in every respect than have poor trash, even if to be had as a gift.

Always look for quality first; and when satisfied in this respect pay the price, if it is anywise reasonable; for you must remember that these extra strains have cost an amount of labor and expense in growing them
largely beyond that required by common-grown stock.

Of course, as we have already said, it is always important, and in some degree essential, that none but the best seed be used; but with some crops this is most especially necessary, and a neglect will result in the most disastrous kind of a failure. Take, for instance, either cabbage, cauliflower, or celery. These are vegetables with regard to which the greatest care has to be exercised, to procure the proper kind of seed stock. Also with onions, lettuce, and cucumbers this is no less important.

It may be well to add, while on this point, that there is more than one advantage in purchasing your seed supply early in the season, and before the spring rush comes on. By so doing you are enabled to get the best that there is in stock, as the supplies have not then been greatly drawn upon; and by attending to the matter before every one is driven with orders you have a better chance to make your selections, and of avoiding mistakes.

It is quite important, unless you can rely absolutely upon the dealer from whom you purchase, to employ some means of testing the quality of seeds. Some have recommended as the speediest way, though not altogether a sure one, putting a few on top of a hot stove; such as are good will crack like corn in parching; the bad will burn without noise and with very little motion. A more reliable way is to place a little cotton-wool or moss in a tumbler containing water, and let it stand in a warm room while the experiment is in progress. Place the seeds to be tested on the
wool or moss so arranged, and they will germinate sooner than they would in ordinary planting. The proportion of bad seed—that is, of seed which has lost its vitality—will be recognized in this way; but as regards the quality of the strain and whether they are true to name, there can be no proof or guarantee in advance of the crop they bring, except procuring them from a dealer who is recognized as reliable, and who knows, himself, what he is selling.

**VITALITY OF SEEDS.**

As regards the period for which seeds may be kept without destroying or seriously impairing their vitality, this varies with different seeds. Opinion varies also as to the time which may be assigned as the limit in the case of each separate kind. It is ordinarily thought, and perhaps it is safest to hold as a general rule, that the seeds which mature in one season are the best for next year's planting. However, seeds of good original vitality may be expected to germinate freely, if properly cared for, at periods after maturity not greater than shown in the table on the following page.

We have to remark here that the duration of the germinating power of seeds depends very materially upon the circumstances under which they have been harvested and kept. Nothing has a greater tendency to destroy it than the influence of dampness and heat; owing to which causes it often occurs that good seed, purchased from dealers in whom reliance can be placed, and kept not a great while on hand, fails to come up. Thus far no better method is known for keeping seeds
in good condition till wanted than putting them in linen bags and storing in a dry, moderately cool, and well ventilated place.

Any seeds, of which the germinating power continues active for five years, on an average, do not entirely lose it after the lapse of ten years or more. In this class are included most of the seeds sown in the market garden — those which possess a less degree of vitality are Corn, Dandelion, Leek, Onion, Okra, Peas, Parsnip, Parsley, Radish, Salsify, and Spinach.

**LENGTHS OF TIME FOR WHICH DIFFERENT SEEDS RETAIN THEIR VITALITY.**

<table>
<thead>
<tr>
<th>Seed</th>
<th>Length of Time</th>
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<tbody>
<tr>
<td>Artichoke</td>
<td>5 years</td>
</tr>
<tr>
<td>Asparagus</td>
<td>4 “</td>
</tr>
<tr>
<td>Beans</td>
<td>5 “</td>
</tr>
<tr>
<td>Beets</td>
<td>5 “</td>
</tr>
<tr>
<td>Broccoli</td>
<td>5 “</td>
</tr>
<tr>
<td>Brussels Sprouts</td>
<td>7 “</td>
</tr>
<tr>
<td>Cabbage</td>
<td>7 “</td>
</tr>
<tr>
<td>Carrot</td>
<td>5 “</td>
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<tr>
<td>Cauliflower</td>
<td>7 “</td>
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<tr>
<td>Celery</td>
<td>8 “</td>
</tr>
<tr>
<td>Corn</td>
<td>2 “</td>
</tr>
<tr>
<td>Cucumber</td>
<td>12 “</td>
</tr>
<tr>
<td>Dandelion</td>
<td>3 “</td>
</tr>
<tr>
<td>Egg-plant</td>
<td>7 “</td>
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<tr>
<td>Endive</td>
<td>9 “</td>
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<tr>
<td>Kale</td>
<td>5 “</td>
</tr>
<tr>
<td>Kohl-rabi</td>
<td>7 years</td>
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<tr>
<td>Leek</td>
<td>2 “</td>
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<tr>
<td>Lettuce</td>
<td>5 “</td>
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<tr>
<td>Melon</td>
<td>7 “</td>
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<tr>
<td>Onion</td>
<td>2 “</td>
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<tr>
<td>Okra</td>
<td>3 “</td>
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<tr>
<td>Peas</td>
<td>4 “</td>
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<td>Parsnip</td>
<td>1 “</td>
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<td>Pumpkin</td>
<td>7 “</td>
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<tr>
<td>Parsley</td>
<td>3 “</td>
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<tr>
<td>Radish</td>
<td>3 “</td>
</tr>
<tr>
<td>Salsify</td>
<td>2 “</td>
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<tr>
<td>Spinach</td>
<td>3 “</td>
</tr>
<tr>
<td>Squash</td>
<td>7 “</td>
</tr>
<tr>
<td>Tomato</td>
<td>5 “</td>
</tr>
<tr>
<td>Turnip</td>
<td>5 “</td>
</tr>
</tbody>
</table>

The general rule above suggested, giving preference to last year’s seed, has some exceptions. Plants such as melons, cucumbers, and squashes (though they grow
Seed Growing—Selection of the Best. 57

vines most vigorously from fresh seeds) are thought to set and mature their fruit better when grown from that which is older. Beans are included by some in the same category.

**Seed Growing.**

Every one who makes market gardening a business is obliged to raise at least a portion of the seed which he plants; and in order to do this successfully, as regards its vigor and productiveness, and so as to obtain the choicest of each kind, great pains must be taken in the selection and care of the seed stocks.

In selecting the stocks from which the seed is to be saved, the very best of the season should always be taken. Particular rows, or even individual plants in different parts of the field, must be marked and reserved for the purpose; and although this is very expensive and tedious it is the only safe and satisfactory way. By so doing the stock is constantly improving year by year; while, if the product of the whole field is saved for seed, as is done by many seed growers, there must be more or less deterioration.

Owing to the differences in climate, some kinds of seeds can be grown to much better advantage in localities other than our own; and, although most of the seeds which are planted in our market gardens can be grown successfully in America, there are a few among these which can be raised to far better advantage in foreign countries. No doubt, one reason for this is that these countries enjoy a climate much more equable than ours—a condition which is more favorable for
all crops, and renders the results of cultivation much more reliable.

The cauliflower, in particular, has a seed which cannot be grown with any certainty in this country; while foreign growers are almost as certain of a crop as we are with cabbage.

Although, in the case of many of the seeds which are produced by market gardeners, through careful selection, in the manner described, one could often purchase his supply from dealers for one-half what it costs him to produce it himself, the quality of his own selected stock may be more than enough better to make up the difference in cost. I have raised vegetables in such large quantities that I have been induced to grow my own seed, to a great extent, and, having often had a surplus, have supplied my neighbors; and my trade in seeds, commencing in this way, has constantly increased from the beginning, until I have been finally obliged to open a seed store in the city, for the convenience of my many customers.

Of course, I do not by any means profess to grow all the seeds I catalogue; but there are several kinds which I can and do grow very successfully, and which I have, by years of careful selection, greatly improved. Of these seeds I grow all that I sell; and, in order to distinguish them from the common strains, I have designated them as "Arlington-grown" seeds. I do not profess to sell these seeds at any such low prices as seeds of the same varieties can often be bought for, elsewhere, from dealers who buy up their stock here and there, of any one from whom they can purchase
cheapest. Any one who will give the matter a moment's thought will see that I cannot compete in price with these cheap grades of seeds.

It is a false view of economy that leads any one to purchase cheap seed, — for a few dollars saved in the beginning may make a shortage of one-half, or more, in the crop. I have always made it a practice when purchasing seed for my own use (of such varieties as I do not raise, and so have been obliged to buy), to secure the best, regardless of cost, and have always found this to pay. Quality, not price, is the chief point to look to in purchasing seed.

The same rule applies to the case of the seed-grower producing seeds either for his own use or for sale — the expense of the process must be disregarded, and the excellence of the product made the prime consideration. All seeds should be gathered as soon as they mature — for exposure to the weather is injurious to their power of vegetating when planted. They should be dried in the shade, and in a warm place, but not where they will be affected by the direct heat of the fire.

Sowing the Seed.

In the preparatory stages of the work of raising a crop, all the points we have included above are of vital importance and need close attention. The successful germination of the seed, no matter how carefully the sowing may be done, must depend largely upon the condition of the ground; But, on the other hand, it is no less true that, unless the seed is carefully and judiciously placed in the ground, and properly covered,
the crop cannot get a good start, no matter how well
the land has been prepared or how good the seed is.

It is far better, when possible, to put seed into fresh-
ly prepared soil, as it is sure to get a better start than
on land which has been turned over long enough to
have become crusty and lumpy on the surface. Again,
it is preferable, when possible, to sow seed immediately
after a rain rather than just before it comes; since, in
the case of the finer seeds, more especially, the crust
which begins to form on all garden soils immediately
after a rain will partly shut out the air and will tend
to prevent free germination. Where one encounters
the misfortune of a heavy fall of rain occurring just
after the planting of a field or bed, it will be well to
go over the ground with rakes, and break the crust;
and such treatment may make a difference of fifty per
cent. in the stand obtained.

With seed having a thick husk, like squash, cucumber,
or melon, it is obviously of peculiar importance
that the soil be in just the right condition—in order
to be sure that sufficient moisture and air may reach
the seed—much more than with thin-husked kinds
that germinate quickly, like cabbage, turnip, and rad-
ish; but, still, even these finer seeds need the most
vigilant attention and the utmost care that can be
given in sowing them, to secure the best results.

In sowing the seed of beets, squashes, and parsnips,
and also peas, beans, and all similar seeds, it is neces-
sary also to plant deeper than the finer seeds, from
the fact that the husk is thicker, and it requires more
moisture to cause germination.
Most of the finer seeds are sown by machine, at different distances apart, and likewise at different depths, varying, according to the kind, from one-fourth of an inch to one inch; being governed partly by the size of the seed, and also by the season of the year. Seed put in during the hot, dry weather of summer must, for obvious reasons, be covered a little deeper than early in spring, when the ground is moist enough for their speedy germination, even if very near the surface.

**Cultivation of Crops.**

After the seed that we have sown has come up, the frequent stirring of the soil will prove beneficial. It is not generally necessary to caution any one against stirring the soil too frequently, still this may, not impossibly, be sometimes overdone, at least as regarded from a financial point of view.

Following a rain, and after the land is dried sufficiently to be in good working condition, is the best possible time for giving the soil a thorough stirring; for then it will be left in a fresh, lively condition, that will give the growing crop a surprising start.

It may be well to note here that it is not profitable to stir the soil when it is too wet, or to hoe crops when they are dripping with water, as some people do; even cabbages, celery, and turnips are not benefited, if indeed they escape serious injury, under such treatment.

In cultivating crops of any description, it is necessary to bear in mind that, when they are young and
growing rapidly, it will be proper to cultivate deeper and nearer to the plants than at a later stage, when growth is not so rapid. At the later stage, such active cultivation would have a tendency to ripen off the crop, rather than promote its growth.

During a dry season, or a period of extended drought, the more frequently the soil is stirred around a growing crop the better; as the loosening up of the surface soil will draw the moisture from below upwards, within reach of the feeding roots of the plants, and thus enable them to absorb it.

In the case of any crop planted in rows, it is a good plan to stir the soil and cut down the weeds, immediately after the plants come up, in the following manner: Take an ordinary A harrow and remove the front tooth; then drive along each row of plants, keeping it exactly between the horses and central to the harrow. This harrowing will not disturb them in the least, and just at this stage will promote their growth surprisingly. The weeds of course will not be exterminated entirely, but their first early growth will be effectually destroyed, and they will more easily be kept under during the rest of the season.

Parasitic insects and vegetable parasites (to which latter class belong smut, blight, mildew, etc.) cause heavy losses and disappointments to all cultivators of the land both on farms and in gardens. The more thrifty the habit and condition of the plants, the less will they be liable to such ravages. Thorough and constant cultivation disturbs and destroys the larvae, reinforces the plant, and enables it to withstand para-
sotic attacks, both animal and vegetable, to good advantage. Further suggestions on this topic scarcely belong to this chapter, but will be given later in the work.

**Construction of Hot-beds.**

For a location, a spot facing the south, with a slope in that direction, is the most desirable. After the location has been selected, a fence should be erected six feet high, and of the length which the bed is to be, to serve as a protection from the wind, and as a support for mats and shutters. For convenience, the fence or wind-break should slant back a little from the bottom, — about one foot: it will then form a better support for mats and shutters when leaned against it, and will be much more convenient in working around the beds.

The first plank should be set about three and a half feet from the base of the fence, and should be two inches thick by twelve inches. The front plank should be two inches narrower. Place the back plank two and a half inches above the ground, and hold in place by driving stakes at the end and middle. Continue the planking in this manner until the desired length is reached. The stakes should, of course, be nailed to the planks. Place the front plank six feet from the first, and sink into the ground so that the upper edge will be five inches lower than the top of the first, which makes a slant of five inches to carry off the water. Continue this the same length as the first, and you will then have a bed six feet wide and of the desired length. Shovel out the loam sufficient to bank the
planks on the outside about half the height, putting in spreaders to keep from crowding in. Let the ground freeze about three inches deep, then cover the banking with leaves or litter to keep out the frost.

**Supplying the Heat.**

If the bed is for lettuce, throw out the loam on the back side of the bed to the depth of twenty-four inches from the upper edge of the plank, and twenty-two inches in front, and of the length required, so as to make room for the manure. Prepare the required heat by selecting moderately coarse horse manure four or five days before using, turning it once or twice. A horse-cart load containing about thirty-six feet is sufficient for a bed six feet square, or for two sashes, the depth of the manure being one foot. This should be trodden down, and made smooth on top; then put in the loam from under the next two sashes, cover to the depth of eight inches, and continue in this manner as far as required; then bring the loam which was taken from the first two sashes, and put it under the last, which completes the bed.

For heating material, various articles are sometimes used, such as hop waste from the breweries, cotton waste, etc.; but where fresh horse manure can be obtained at anything like reasonable rates, it is far better, and, all things considered, is actually more economical; as the manure can, of course, be used on the land after it has served its purpose in the beds; and it is then, as ordinarily considered, worth half the original cost. Then, too, where manure is used the ammonia
which escapes during the heating process is of great benefit to the growing crops, while from other material there is no such benefit — substantially nothing but the heat is derived.

Radishes require less heat than lettuce, just as a crop of young cauliflower or cabbage requires less heat than tomatoes, egg-plants, or others of a tropical nature. For radishes, a cart-load of manure, containing thirty-six feet, would be sufficient for nine feet of bed, or three sashes, and should be covered by one foot of loam. For forcing cucumbers more heat is required than for lettuce, according to the season. In any case, the bed should stand a day after it is prepared, to allow the soil to heat through; it is then ready for seeds or plants.

The quantity of heating material to be used will not however depend entirely upon the crop to be grown; we must also take into account the season of the year when it is to be started. With lettuce, for instance: if the crop were to be planted in December, a foot of fresh manure would be necessary; while in February or March one-half that quantity would be sufficient. But for such tropical-natured plants as tomatoes, cucumbers, or egg-plants, a foot of heating material would be none too much at any season.

A crop of radishes would not perhaps require quite as much heat as lettuce during the winter months; still it would need about the quantity stated to keep the bed properly warm. If started in March, no strong bottom heat would be required; and they will succeed well on second heat, such as is in a bed from which a
crop of lettuce or other vegetables has just been removed. In this case the crop will often do better than when sown in a freshly made bed, as in the latter the ammonia, which new heating material always throws out, would have a tendency to drive the crop too much to tops; which is not what is wanted with root crops.

The continuous care of hot-beds after the crop has been started forms one of the most important branches of work in the market garden. The beds require to be covered and uncovered every day, and constant attendance and vigilance are necessary to maintain the proper temperature. The amount of heat to be aimed at, as we have already said, depends upon the crop.

Lettuce beds, during the winter months, should be kept at a temperature ranging at from 50° to 70°. For radishes it may range from 40° to 60°; while for cucumbers and tomatoes it must range decidedly higher, say from 70° to 90°, or even 100°.

In the spring of the year, it is quite a serious task for a man to take charge of say 1,000 sashes, with a half a dozen different crops under them. He must of course have a thorough understanding of their requirements in respect to heat, moisture, and a variety of other conditions. He must be a person of considerable experience or he cannot be qualified to undertake the entire management of crops so cultivated. It will be found that much depends on their receiving the right care, and always just at the right time.

If the first crop is started in November or December, and the beds are properly handled, three and sometimes even four crops may be taken from the
Gathering the Crops.

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glass each season. In regard to the amount of produce that can be taken off, per sash, each season, of course much depends on skilful management; but if the beds are properly attended to (where three crops are grown) the results might, ordinarily, be expected to be about as follows: say for the first crop, $2.50; for the second crop, $2.00; and the third, $1.50; making a total of $6.00 per sash. These figures are of course often exceeded, and even doubled; but we are now giving estimates of a result as near an average as possible.

The first crop embraced in the foregoing estimate would be lettuce, four dozen to each sash, at 62½c. per dozen. The next, either lettuce or radishes; the third, cucumbers, which would be put under the glass about the first of April and begin to bear June 1st. The latter crop varies in price according to the season, some years averaging as high as three dollars per sash; but for a large quantity, a cash return amounting to a dollar and a half per sash would be considered by most growers as reasonably good.

Harvesting or Gathering the Crops.

In market gardening the term "harvest" cannot be applied as it was in olden times to the gathering of the grain and other crops in the fall of the year. Under modern usages there is no real season of harvesting, but, on the contrary, the "seed-time and harvest" seasons, both of them, extend the whole year round.

Much experience is required to enable one to know just when to harvest market-garden crops, and this
does not always or solely depend on their stage of maturity. The market gardener of to-day would say that the time to harvest a crop is when it will bring the most money. Although of course there are some vegetables that cannot be gathered until they are ripe, as otherwise they are practically worthless — such as melons, celery, and cauliflower, which it would be folly to touch until they had reached maturity — yet also there are some, like beets, lettuce, spinach, etc., which, after reaching a certain early stage of growth, can be marketed readily, and to profit.

In crops that are to be marketed when young and tender, it is plainly of vital importance to have experienced hands for the work, as such articles are very easily injured, and rendered unsalable by careless handling and packing for transportation.

The same considerations, though perhaps less obvious, are equally important in the case of vegetables that are to be stored for the winter. These also should be harvested and handled with care, and placed in storage only when dry or in just the right condition, for their keeping qualities must largely depend on their treatment at this time.

The Amount of Capital and Labor Required.

Among gardeners, opinions vary as to the area that an individual may wisely include in his plans. Many have an idea that five acres of land will be enough; others put it at ten; while it is known that some cultivate a hundred acres or more at a profit. The amount of capital required varies, to some extent, with the
amount of land cultivated, but not in a uniform proportion.

While it might require about $3,000, with the labor of three men and two horses, to properly handle two acres, I estimate that there would be needed about $5,000, six men, and three horses for ten acres; and that $20,000, forty men, and twenty horses would be sufficient for one hundred acres.

One of the largest and most indispensable items of original outlay is in providing the sashes; these cost, with the requisite mats and shutters to go with them, about $4.00 each, of which about $2.50 is paid for the sash, and the balance for mats and shutters to correspond.

A very important item of annual outlay is the supply of stable manure. This will cost, at present prices, delivered on the place, from $5.00 to $8.00 per cord, according to distance from the city and the facilities for obtaining and transporting it.

The land cultivated may be the gardener's own, or may be worked under a lease. In the latter case, the annual rent per acre is, at an average, say $25.00 for highly cultivated land, while other land in the remoter suburbs, and not in as good condition, might be had for $10.00 per year.

There may doubtless be found some tracts of land under cultivation where ordinary interest reckoned on the purchase money invested would amount to $200.00 or more annually, per acre; but these are of course exceptional cases.

With regard to the expense of labor, it may be stated
that average men receive about $40.00 per month, or about $1.50 per day, during the summer season, and about $35.00 per month, or $1.35 per day, during the four months of winter. Of course skilled laborers might expect to receive more, but to obtain it they must be men of some experience and natural adaption to the work. The business is one in which men of tact and experience are in demand, no less than in a manufacturing or mercantile establishment.

The expense of keeping the work-horses, including all items, would amount to about $150.00 on each animal per year. The tools are a less important item of expense, and yet the new and improved implements of the present date are quite costly, and the cultivation of even a limited amount of land requires quite a number of them.

By looking over the foregoing it will be seen that the total annual expense of running two acres of land would be about $2,500. That of five acres would foot up about $5,000; of ten acres, about $8,000; while a hundred acres could be run for $25,000. Many people have a mistaken idea that they can run a garden of ten, fifteen, or twenty acres on a capital smaller than is really requisite to properly run three acres. If one's capital is limited, it is far better to proportionally reduce the amount of land than to spread over too much surface.
PART II.

Directions and Descriptions in Detail.
CHAPTER IV.

Vegetables Raised for Market—Characteristics—Cultural Directions.

The Artichoke (*Cynara Scolymus*) is used extensively in Europe, either raw as a salad or boiled and served after the manner of cabbage. It may also be blanched somewhat as we treat endive—that is, the side stalks—and it is then used as a salad.

It may be propagated either from the seed or by root cuttings. The latter is the best and most convenient plan; the offset suckers should be taken in the spring. When raised from seed, let them be sown early in the spring, say at the time of the flowering of the peach, in drills a foot apart, and four inches apart in the drills. The next spring transplant to permanent beds, in hills three feet apart each way, with three plants to a hill. It requires a deep, rich loam, abounding in moisture.

As the plant is perennial, one planting will answer for several years. No winter protection will be required except in the most northern States, and there a coat of straw or leaves will suffice to insure them against winter killing.

The Green Globe and Common Green, which are
(1) Jerusalem Artichoke.  (2) Bunch of Asparagus.
much alike, are the varieties we have had in mind in writing the above, but there is another variety, called the Jerusalem Artichoke (Helianthus tuberosus), which differs from these in the fact that it is cultivated for its tubers, which are pickled like cucumbers or eaten raw sliced as a salad. They are planted like potatoes, in hills or rows, and will produce enormous crops. The tubers make excellent feed for all kinds of live stock, being the richest in fat-producing elements of any of our cultivated roots. Care must be taken at the time of harvesting to remove all the small roots, for if left in the ground they will come up the next spring, and may become a troublesome weed.

Asparagus (A. officinalis) is a peculiar crop, and generally speaking is a reliable one. The fact that it takes two years from the setting if two-year-old plants are set, or four years if the seed is sown, prevents many from growing it. It is not generally grown in the immediate vicinity of Boston or other large cities, as the land is usually too valuable. The average proceeds per acre are moderate; from $200 to $300.

As compared with other crops, it is a good one to ship, and will stand up well for quite a length of time.

Asparagus is a hardy, perennial, maritime plant. It may be grown from seed, or propagated by roots. One ounce of seed will sow about fifty feet of drill. It will thrive on almost any sandy soil, even if quite light, and the lighter the soil, other things being equal, the earlier the crop may be got off. A planting once properly made will last for years. A fair crop may be expected the third year from the seed, or in one or
two years from the roots, according to their age when planted, and, after that, full crops every year.

The soil for this crop cannot be made too rich, and should be thoroughly trenched two feet or more in depth. The plants should be set six to eight inches deep, in rows three to four feet apart, and one foot apart in the rows. The roots should be set in the spring as soon as the ground is in good working order (they can be set in the fall, but the spring is the preferable time), say about the end of April. The crowns of the roots should be from four to six inches from the surface of the bed. A heavy application of manure must be made to an asparagus bed each fall — say eight or ten cords per acre. This should be lightly worked into the soil in the spring: a very light surface-ploughing will accomplish this well, if carefully done. Salt is an excellent thing to apply for a dressing, for, although it does not act as a manure, as some people think, it is a great help in keeping down the weeds.

In cutting for market, the cut is made about two inches under the ground, and pains are taken to have the stalks about eight inches long. In preparing for market a buncher is used, so that all bunches are of exactly equal length and size. From twelve to twenty stalks are put in each bunch, according to the size of the stalks. They bring, on an average, about $1.50 per dozen bunches, still the price varies greatly with different seasons and depends largely on the supply of peas and greens that may be in the market. The season for cutting usually continues about five weeks, and the plants are then left to go to seed. In the fall
these seed stalks are mown down and the refuse is burned off.

The varieties are numerous and differ considerably. Conover's Colossal is the most popular; and Moore's New Giant Cross-bred is now attracting much attention.

Beans (*Phaseolus vulgaris.*) — Dwarf or Bush kinds. This familiar crop flourishes best in a rather light gravelly soil; and it should never be planted in very heavy land. The bush beans are rather more hardy than the pole varieties, but nevertheless should not be planted until settled weather; say, in this section, about the first week in May. Nothing is gained by putting them in when the weather is cold, or the land damp and soggy, for they are a crop that never recovers from a set-back received early in the season.

In manuring for the crop, we have found it works
well to give the land a fair dressing of manure (lightly worked into the soil) and then give a light application of some good fertilizer, such as Sparrow's, or Bradley's Phosphate, in the drill at the time of planting. This seems to give the crop a quicker and better start than it gets where manure is applied directly in the drill. The distance apart for the rows should be from three to three and a half feet, and the seed dropped from four to six inches apart in the drill (which should be from an inch to an inch and a half in depth). At this distance apart about one bushel of seed would be required per acre, where all the land is devoted to the crop; but many prefer to plant every fourth row with squash, so as to double-crop the land.

A fair average yield per acre would be from three hundred to four hundred bushels; and the crop ought to bring from seventy cents to one dollar per bushel. A good picker should pick two and a half barrels per day, or about eight bushels.

After the crop is fairly up, the cultivator should be run through lightly; and, at the second hoeing, a little earth should be drawn towards the plants to support them. They should never be hoed or worked amongst, if it can possibly be avoided, at times when they are wet, either by rain or dew, as there is much danger of rusting or blighting the crop.

The list of varieties is numerous and contains many of real merit. The Early Long Yellow Six Weeks is the earliest good market variety, of first-rate quality and excellent in every respect. Its pods are green. The Early Mohawk is another good kind, closely re-
Dwarf Varieties—Pole Beans.

seeming the Six Weeks in habit. It is nearly or quite as early, and is also a green-podder. Dwarf Yellow Cranberry is another excellent green-podded variety, a trifle later than the above, but of excellent quality, and is a favorite snap bean for the market.

Golden Wax.—This superb variety is fast becoming a leading sort, both for the market and home garden. It is certainly the very best wax bean in cultivation. As its name implies, the pods are of a rich golden-yellow; they are stringless and of fine flavor. It is very productive—not surpassed in this respect. Black Wax resembles the Golden, but is a trifle later. Pods are round instead of flattened.

The White Wax is waxen-podded, very tender, and of good quality. This is a favorite with many for the home garden. The Early Valentine is undoubtedly an excellent variety, of a tender and succulent growth. It is not very much cultivated in this vicinity, but only because it happens to be less generally known here than in other parts of the country.

The Dwarf Horticultural is the standard market variety, and is the leading dwarf Shell Bean. Pod very plump and large, streaked with bright red. The Goddard is a splendid variety, somewhat later than the above but of excellent quality, and very prolific. The pods are of a brighter red than the Horticultural, and the yield is heavier.

The Pole or Running kinds are less hardy than the bush varieties, and will not bear planting quite as early. From about the middle of May to the first of June, according to the season, is about right with us.
Market Gardening.

They should invariably be planted in hills which should be about three feet apart with rows four feet apart. From five to six seeds should be placed in each hill, with the eye downward; and should be covered to about the same depth as is directed for bush or snap beans. A quart of seed will plant a hundred and fifty hills; the poles should be set at the time of planting.

They succeed best in sandy loam, which should be liberally enriched with short manure in the hills. Three plants in a hill are as many as should be allowed to grow, and with the vigorous growing kinds on strong soil it is better to have only two. The thinning should be done when the plants have become well established. They bear transplanting well, and this affords a means of filling up around the poles wherever they miss or fail to come up. They can also be started in frames and transplanted to the open ground, so as to secure an ad-
Pole Varieties—Scarlet Runner—Lima.

vanced stage of growth and earlier maturity; but this is not extensively practised.

The maturity of some of the later sorts can be hastened by nipping off the tips of the runners when they have reached a height of four or five feet.

Red Cranberry is an excellent variety, of good quality, productive and stringless. The pods retain their tender and palatable quality until they are quite enough grown to shell beans. As a shell bean it is good while green; but is not often used after ripening and drying.

White Cranberry is very similar to the above variety, but not quite as productive. Some prefer it, however, on account of its being a white bean.

Pole Horticultural has perhaps a greater combination of good qualities than any other pole variety. It is excellent as a string bean, unsurpassed for shelling green, and, moreover, is one of the best varieties on the list for cooking in the dry state.

Indian Chief.—This bean is remarkable for its tender, succulent, and richly colored pods, and is well worthy a place in every garden. It is a very productive sort. The pods remain tender and crisp a long time. The seeds are not often used in the dry state—in fact, as a rule, no black beans are used dry—but for a string Pole Bean this variety has no superior.

Scarlet Runner (P. multiflorus) is rather late, and should be planted as early as possible. In this country it is produced mostly as an ornamental climbing plant.

Lima Beans (P. lunatus) are very tender, and should be planted after the ground is warm and mellow, say about the first of June. Or they may be started earlier
Improved Lima Bean.
English or Broad Beans—Beets.

in hot-beds, like cucumbers and melons, and transplanted to the open ground at about the time stated.

Dreer’s Improved Lima is a little earlier than the old Lima; very productive. The beans form very closely in the pod, and are of excellent quality and flavor. Sieva or Small Lima is smaller than the above but cannot be excelled in quality.

ENGLISH OR BROAD BEANS (*Faba vulgaris*) although not very popular in this country, are largely grown in

[Image: Broad Windsor Bean.] England. The Broad Windsor is the favorite variety. Mazagan is early and hardy, but is less productive.

THE BEET (*Beta vulgaris*) is one of the most important crops, and is of easy culture. Where possible, a rather light, sandy loam should be selected for this crop in preference to heavy soil. For the early crop
the seed should be put in about the middle of April, or as soon as the ground is in suitable working condition. The rows should be planted by machine, at distances of from twelve to fourteen inches apart, and the drills should be one inch deep. After they have gained a foothold the plants should be thinned to eight or ten inches apart in the drill. Clean culture should of course be given.

The above remarks apply to the crop when grown for early marketing. For winter use the seed should be sown about the first of July, in drills drawn at the same distances apart as above directed, but the plants should be left nearer together, say at intervals of from five to six inches.

Of varieties there are a large number known and named, but few of really superior merit. The Early
Early Varieties—Chard Leaf-Beet.

Bastian, for early cropping, and Dewing Blood Turnip, for a standard sort, are as popular and as good varieties as we could name. The Early Bastian is one of the very earliest, and is one of the best as regards quality. It is not a true blood beet, but is sweet and of very good quality at all times of the year. It is the most popular early variety grown in this section.

Swiss Chard Beet.

The Dark Red Egyptian is claimed to be the earliest variety in cultivation, but many believe the Bastian, and also the Eclipse, to be equally early. In shape it is much flattened; color, deep crimson; top small. It is certainly very early; and very good when small, but when full grown it is woody and poor in quality. The Eclipse is a new comer for which much is claimed. It has been in the market only four or five years; it is a blood beet, very fine grained, of good
shape, and good at all seasons of the year. The Swiss Chard is a peculiar sort, cultivated principally for the leaf stalks, which are cooked and served like asparagus.

The early beets are nearly always bunched, instead of being sold by the bushel. They are pulled when grown to about the circumference of a silver dollar, and are tied four in a bunch. The bunches usually bring from four to five cents each, and are sold by the dozen or hundred. At this price a good crop of early beets would bring returns of from $400 to $500 per acre. The thinnings are saved and sold for greens, by the bushel, like spinach. Late beets are of course sold by the bushel. A fair average yield, per acre, would be about 300 bushels; which ought to bring at least $150.

In southern New England such early varieties as the Early Bastian, Eclipse, or Egyptian can be sown the second time on the same ground, each season, and two crops per year can be raised; but with the later varieties, which require about two weeks longer to mature, the season would not be long enough.

Beets of the early varieties also make a first-rate second crop to follow peas, early cabbage, or any other early crop that is off the ground so that the beets can be put in by the 20th of July.

The amount of seed required, per acre, for the early crop (to be thinned for greens) is eight pounds. For the late crop six pounds is the proper quantity.

Bo
coc
e, or Kale (Brassica oleracea acephala) is a name applied to the class of Cabbage which does not
head, but is used as an esculent in its open growth. When used, the crown or centre of the plant is cut off so as to include the leaves, which usually do not exceed nine inches in length. It boils well, and is more tender, sweet, and delicate, provided it has been duly exposed to frost. To secure heavy crops of this hardy, useful winter vegetable, a deep, rich soil is essential, and the ground should be trenched two feet deep and liberally manured. Sow about the middle of April, in well prepared soil, covering the seeds thinly and evenly. Half an ounce will sow a bed of twenty square feet. Plant out in June, and cultivate as elsewhere recommended for cabbage.

The Dwarf Purple, or Brown Kale, which is represented in the cut here inserted, is a beautiful curled variety, with reddish-tinted leaves. Another is the Green Curled Scotch, which is very hardy, and, like the Savoys, is improved by a moderate frost.
In cultivating the Improved Siberian variety—a strain of the kind known as German Greens, or "sprouts"—sow in September, in rows one foot apart, and treat the same as spinach. This is a very hardy kind, much grown by the New York gardeners.

Broccoli (Brassica oleracea Botrytis) is a variety of cabbage very closely resembling the cauliflower. There is scarcely any difference between the two beyond what would naturally be looked for between different varieties. It is hardy, and sure to head, but is inferior in flavor.

All the varieties of Broccoli require a rich, deep soil; and the ground should be trenched to a depth of at least two feet, well incorporating, as the work proceeds, abundance of rich manure. Where the object is to obtain fine large heads, too much manure can hardly be used.

The seed should be sown in hot-beds, for early crops, in March or April; for main crops, in the open ground in May, in beds of well-pulverized rich soil, making the surface fine, and then beating the seed gently into the ground, and covering it with fine earth.

One ounce will sow a bed of forty square feet, and produce about 3,000 plants. When the plants are sufficiently strong, and before they are drawn by growing too closely together, transplant them into nursery beds or lines, allowing about four inches between the plants. This will insure strong, stocky plants, and will also induce the formation of an extra quantity of roots.
Broccoli—Brussels Sprouts.

Plant in permanent situations as soon as the plants are sufficiently established, taking care not to injure the roots, in rows from two feet to two feet six inches apart, leaving about the same distance between the plants. Keep them well supplied with water until they get fairly established, especially the early varieties, and these must also be liberally watered in all stages of their growth during dry hot weather.

Keep the ground well stirred between the rows, and free from weeds. When they begin to flower, break the large leaves over the heads to protect them from the sun, and gather them before they commence running up to seed. Broccoli thrives best in cool, moist, fall weather,—hot, dry summer weather not being suited to it. The heads are cooked the same as cauliflower.

English seedsmen catalogue an almost endless number of varieties, but there are only a very few of distinct and admitted merit. Walcheren is an excellent variety, with large white heads. Early Purple Cap is an excellent sort; but many do not like the greenish-purple color of the heads. White Cap is, perhaps, our best variety; heads very white and solid,—a sure header.

This vegetable is not raised extensively in any section of this country, except in California.

Brussels Sprouts (Brassica oleracea bulbosa).—This is yet another of the Cabbage family, and like Broccoli is little grown here, though its excellent qualities seem to be fully appreciated by our English cousins. The culture is simple, and very much the same as
is adopted for cauliflower or cabbage (except that it must be remembered that the Sprouts are a little less hardy). A similar quantity of seed is required. The seeds should be sown in March or April in the hot-bed, or in the open ground when the weather permits. When the plants are about three inches high they should be transplanted. The early ones will be ready for the table in September; the late ones, for winter use, should be harvested before cold weather, and stored the same as cabbages or cauliflowers.

The small heads, which grow along the stem, are the eatable parts of this vegetable, and when boiled like cabbage, or stewed with cream, like cauliflower, are very tender and delicious. Where the winters are not very severe, they may remain in the ground, to be cut as needed; in fact, the sprouts are much improved by a moderate frost. The leaves, which resemble the Savoy, should be broken down in the fall to give the little cabbages room to grow.
Cabbages—Cost of a Crop.

Dwarf Improved is very tender and is distinguished for fine flavor; it is the best kind for general use.

Cabbage (*Brassica oleracea capitata*) is one of the most important and one of the best paying crops.

Lettuce can be set between the cabbage rows, to be cut off before the growth of the main crop will interfere with it. In this manner three crops may be grown each season; which will make the land pay as well as can be done by almost any other system of cropping.

As cabbages require a large amount of lime, they should not be grown on the same ground oftener than once in three years, unless a special application of lime is made. This is often done, and especially in the vicinity of New York City; but, where practicable, it is better to avoid devoting the ground continuously to crops of the cabbage family. And it is also better to avoid putting in cabbages to follow any shallow-feeding crop (like corn, for instance) as they collect the greater part of their nourishment near the surface, and are moreover rank feeders; so that it is well to let them follow and be followed by some deep-rooted crop.

On land already in good tillable condition, an application of twenty cords of manure per acre is about what will be required. We prefer well decomposed horse manure to any other. This manure may cost about $8.00 per cord, delivered on the place.

The applying would cost about $6.00; ploughing, $2.00; marking, or furrowing, $2.00; setting, or transplanting, $5.00; hoeing, $5.00 (which would include cultivating); plants (6,000 at $5.00 per thousand),
Market Gardening.

$30.00; rent, $25.00; marketing, $25.00; making a total of $260.00.

If set at intervals of three and a half feet by two feet, the number of plants that can be grown per acre is six thousand. And it will be seen that they cannot be grown at less cost than four and a half cents per head. The general average price is only six cents, which would indicate a profit of only $100 per acre; although, of course, if they should bring eight or ten cents, as they often do, the profit would be handsomely increased.

It will be seen that we have charged all the twenty cords of manure to the cabbage, while in fact the cabbages only take a share of it, and usually leave an abundance for the crop that follows. So it becomes a rather difficult matter to figure the exact cost by itself of growing a field of cabbage; but after the second crop is harvested it will be an easy affair to distribute the expenses between the two, and thus one may get at the matter very closely.

If it is seen that the manure which has been applied is not sufficient to carry out the crop, a dressing should be given of half a ton of some good commercial fertilizer that is rich in potash. Wood-ashes, when obtainable, are excellent for this purpose.

Although the list of varieties is large, market gardeners have but few that they regard as reliable. The Jersey Wakefield is really the early market cabbage, and is undoubtedly cultivated to a greater extent than any other one variety for the first early crop. Although this sort is a few days later than the very earliest, it is
Early Varieties—Rawson's—Etampes. 93

enough larger to make up for the difference in time, and is usually more profitable than the smaller varieties. Rawson's Early Summer, represented in the subjoined cut, is next in order; it excels both in size and earliness, and ranks as the best of the early Drumhead sorts. It is a trifle larger than the Wakefield, and consequently the setting should be a little farther apart. We would not advise setting any closer than three and a half feet for the rows, and plants at twenty inches, as this will give them none too much room. And although

Rawson's Early Summer.
they may be, and in some cases are, planted closer, it is not so desirable, especially in this market.

The wider planting is better, even in places where cabbages are sold entirely by weight. We do not doubt that by setting at two feet apart each way just as many pounds per acre could be raised; but the advantage in the wider style of planting is that less plants will be required per acre, and consequently there will be less work in cutting; and further, the cabbages will usually be harder and of better quality.

The Early Etampes is about ten days earlier than any other cabbage. The heads are oblong, rounded at the top, and of medium size; they are very solid and firm, and of good quality. It is a new French sort.
Young Plants—Later Varieties.

Fottler's Early Brunswick is a very popular variety, about two weeks later than the Early Summer.

For the early varieties, which we have mentioned above, the seed is usually sown in hot-beds, from the 10th to the 20th of February. They should be covered about half an inch deep. In about four weeks they are ready for transplanting, which is usually done in a bed from which a crop of lettuce has just been removed. They should be put in about three and a half inches apart, so as to give them plenty of room to grow stout and stocky. By this rule two hundred plants are put under each sash. After they have obtained a good start the sash should be removed gradually, to allow them to harden off; and they may be given all the protection necessary in severe weather, by the use of shutters. They are usually transplanted to the
open ground either the last week in April or the first in May, according to the season.

The variety adapted to follow the Fottler’s Brunswick (which we have classed among the early kinds) is an improved strain of the Stone Mason, and is catalogued by some seedsmen as the Warren. It is somewhat earlier than the ordinary strain, which is very largely cultivated in this section as a late variety. The Premium Flat Dutch is a very popular Drumhead variety, and the best strains of it are equalled by but very few other varieties. They are grown as a regular fall crop. Marblehead Mammoth is a very large sort, and the latest on the list of fall varieties; it is also an excellent keeper. The Curled Savoy ranks among the latest, and is grown mostly for winter use. The Drumhead Savoy differs from the curled, in being of larger size and less curled. As a Savoy it is less desirable than the former for eating, but is profitable to raise.
Late cabbages are usually grown as a second crop, following peas or something similar in culture; or they may be set on newly turned land which has been in early grain or grass. It is not generally necessary to apply as much manure as for the early crop; twelve cords is usually an abundant dressing, especially where they follow some other crop which has been well manured the same season.

To keep cabbage through the winter, commence by making a small bank, say about one and a half feet high, in some sheltered locality. Pull the cabbage, and place the heads against the bank in a row as close as they can stand; then turn up the earth with the plow against the row. Be careful not to cover the head, but make the earth firm around the roots. Then with a shovel square down the bank thus made, and place another row; this will be about eight or ten inches from the first, and so continue until the whole are set out. Another way is to place the cabbages head downwards on the ground, and cover the heads and stumps with dirt, then adding hay or something similar to keep out the frost. This protection should also be given in banking up by the other method. Put on enough to be sure that they will not freeze solid. If frozen about half through, they are not injured, and will keep quite well. Some have houses where they store the cabbages, placing them head down on the shelf, laying them as close as possible, and only one deep. The temperature is kept at about the freezing point.

Carrot (*Daucus carota*) is perhaps more properly to be called a farm crop; still, to some extent, it is grown by
market gardeners who chance to be located near large cities, and yet on land that is not too valuable. They require a very finely pulverized and porous sandy loam for their full development, and for large crops. It is important that the land should not be too rich, as then the crop will run too much to tops; and still they should not be placed on poor, light soil with the expectation of a big crop. Land that is in fairly good condition, and has been manured the year previous for some other crop, is usually quite rich enough for the growing of carrots.

When the short varieties (like Early Horn, Intermediate, etc.) are raised for bunching, they are usually put in as a second crop with spring spinach and radishes. They are tied in bunches, four in a bunch, like early beets; and usually bring, on an average, four cents per bunch. But there is only a limited demand for them.

When grown under glass, they are usually raised as a third crop in the following manner: After a crop of lettuce has been removed from the bed, perhaps
about the first of February, the ground is sown to radishes and carrots, putting the latter in every third row,—so that there are two rows of radishes to one of carrots. About the last week in March the radishes are ready for pulling, which leaves the carrots in full possession of the beds. The Early French Forcing is the leading variety for hot-bed culture. The plants have but a very small top, run very even in size, and are of good appearance.

The sash, being usually removed some time between March 20th and April, can after that date be used for some other purpose, and, until warm weather, all the protection needed by the carrots may be given with shutters.

They will be ready for pulling and bunching about the last week in May (taking for their growth about twice the time of the radishes). At this season they will usually bring on an average $1.00 per dozen bunches, five carrots being put in a bunch, and at this price the crop will bring about $1.50 per sash.

For out-door culture the Early Scarlet Horn or Butter is the earliest variety, and can be sown either as a separate crop or with others. This is a stump root variety, and is grown exclusively for bunching.
The Danvers Half Long Orange is the standard main crop variety; being usually sold by the barrel, box, or bushel, for fall and winter use. It is a remarkably prolific variety, yielding frequently (and in some instances considerably) over forty tons per acre. It is withal an excellent keeper.

The Thick Half Long Orange is an excellent strain of the ordinary Improved Long Orange, and is extensively grown in field culture; but is not as desirable, except for stock feeding, as the Danvers. The Improved Long Orange is the standard stock carrot. The roots are large and long, and are of good quality for feeding. The Large White Belgian is used for stock only. As the crown of this carrot grows five or six inches out of ground, they are more easily dug than any other sort; and are liked by many on this account. The Long Scarlet Antrimham is a very irregular shaped red variety. It is less productive and is no better in any way than the Long Orange.

CAULIFLOWER (Brassica oleracea Botrytis). The culture of this crop involves much painstaking labor;
nevertheless, in the vicinity of Boston, the acreage devoted to cauliflower has been largely increased during the past few years. Many cultivators who formerly raised but an acre or two now grow three or four acres; and fields even as large as eight or ten acres are not uncommon. When grown in large quantities, they are usually stored in the fall for winter marketing. It is naturally a fall crop and will not well bear early forcing. From the first of May until the first of July, according to the time the plants are wanted for setting, is the time to put in the seed. They are one of the various forms of the cabbage family, and require the same general conditions.

When they do well they usually pay better than early cabbage; but there is much more risk in cultivating them. As raised in this locality, about 6,000 are grown per acre, and if maturing well, will bring in
about $700.00. The price varies from $1.00 to $2.00 per dozen.

They are usually grown, like late cabbage, for a second crop. Sometimes a piece of land is devoted solely to them through the season; but when set early they do not usually head as well.

There is no garden crop that is pinched more severely by a drought than the cauliflower; and none, perhaps, which will pay better for irrigation.

For the main crop, early variety, there is with us nothing so good as Rawson's Sea Foam, which derives its name from the pure white color of the heads. It is quite distinct and the surest header we know of. The Snowball, being a very sure header, is quite desirable, although not equaling the Sea Foam with us. The Early Dwarf Erfurt is one of the standard varieties, and used both for early and late sowings. It is a very sure header, not large, but even in size. The Late Erfurt is a later strain of the preceding, and consequently requires a longer season to reach maturity. It is large in size. The Half Early Paris is also a late variety, but does not make as compact heads as the Erfurt. The Algiers is a splendid sort: the largest and latest of all.

Celeriac, or Turnip-Rooted Celery (Apium graveolens rapaceum), although but little used in this country, is quite popular in Europe, especially in Germany and France. It is rather peculiar in its manner of growth. It is started, and in its early stages should be treated, precisely like celery. except that, as it requires but a slight earthing up, the plants may be set much closer.
Two feet apart for the rows, and eight inches for the plants, will give abundance of room. For winter use, it may be stored in trenches, like celery, or placed in sand in a cool cellar. The globe-shaped bulb, or root, is the edible part of the plant. The Erfurt is the favorite variety, and is about the only strain catalogued in this country.

**Celery (Apium graveolens).** In selecting a place for starting the plants, choose, if possible, a cool and partially shaded spot. The soil should be put in good condition, and firmed down. After it is prepared in this respect, rake the surface lightly, and sow on the
seed broadcast; then place a hot-bed shutter, or a plank, on the surface, and have a man walk or jump upon it until the soil is again well compacted. After this, sift on soil—just enough to cover the seed lightly, not over a quarter of an inch at most. Then pat down moderately with the back of a spade, or shovel; and the work is done, except watering, until the plants are well up. The bed should be kept constantly moist, but not too wet. An ounce of seed should sow a space about six feet square, and should furnish fully six thousand plants.

When the celery is to follow cabbage, or other early
crops, the plants are usually twice transplanted. When lifted from the seed-bed, they are put out five or six inches apart. In this section, celery is invariably grown as a second or third crop. The soil best adapted to celery is a strong, deep, sandy loam, naturally moist; and it needs and must have plenty of moisture during droughts, or a shortage will be the result.

Where celery is to follow early cabbage, it is the usual custom to plough the land before setting the plants. But no manure should be added to that already in the soil. The plants must be put in at just the right depth—just so deep as not to cover the crown—and the loosened soil must be brought together firmly about the roots. Celery of all kinds should be planted on a level, and not in trenches.

The first transplanting is to be done in June, the second in July. If the crop has been planted out early, it is well to commence banking it the first week in September, or about four weeks before it is wanted. Two bankings will suffice for the early crop, and they should be timed about ten days apart. For later use, say about Thanksgiving time, commence about the first of October; repeat the banking about the tenth, and still again about the twentieth. For winter use, bank about the fifteenth or twentieth, according to the season; and if the celery is not very large, one banking will be sufficient.

When it is ready for storing, it should be taken up and placed in pits prepared for the purpose. The roots should be covered the same as if they were standing
in the ground; and should be placed about six inches apart, if they are to remain on hand long, so as to allow the air to circulate properly.

To prepare a pit for storing celery make the sides of plank, 24 feet apart and about two feet high from the ground. The boards for covering should be thirteen feet long, the ends of two lengths meeting each other on the centre of the pit; where it should have an interior height of six feet. Enough loam is thrown out from the inside, in forming the pit, to embank the sides and ends.

In setting the celery, commence at one end of the pit: dig a trench about three inches deep, and set in the celery as closely as you can in the row. In taking up loam for covering the roots of one row, another trench is obtained for setting down the next. Be careful to make it stand up perfectly straight: and, either in the field or in the pit, the yellow leaves should all be removed before the packing in.

The pit can be extended to any length desired, and partitions may be employed: so that portions of the stock can be kept cooler, and so held back; or can be kept warmer and ripened off.

The pit coverings of boards must be put on as fast as the celery is got in. Small ventilators, about one foot square, are constructed along the centre, about twenty feet apart. These are opened in clear and moderately cold weather; and thus the temperature is kept at about 35° to 40° Fahrenheit, until a supply is wanted for market—when they can be kept closed, and the celery allowed to ripen.
Arlington Celery—Other Kinds.

The best material with which to cover the celery for long keeping is salt hay; but it can be ripened quickest under seaweed, which packs very closely when wet. One foot in thickness is sufficient for its protection if the outside thermometer does not go below zero. Some old mats or shutters may be put on for a short time when the weather is very cold. Thermometers should be provided,—one to be kept near each end; and, if the pit is one hundred feet long, or more, one will be needed in the middle.

The list of varieties is large: but still, as in the case of many other vegetables, there are but few of really superior merit. Rawson's Early Arlington is fast becoming the leading variety in the Boston market. It is first class in quality, and fully three weeks earlier than the old stand-by known as the Boston Market variety—grows larger, and yields more profit.

Sandringham Dwarf White is an excellent dwarf variety, of an upright habit of growth. Carter's Crimson is a very dwarf, solid variety, crisp and tender,—first class as a red variety. Henderson's Half Dwarf is somewhat similar to Crawford's; when blanched, it is of a yellow tinge, crisp, and of an agreeable, though rather peculiar nutty flavor. The White Plume is a new dwarf variety, with a very marked peculiarity in the foliage. It is very white, and, being rather tender, is not an extra keeper.

The Golden Heart celery is grown mostly by gardeners in the celery region of Kalamazoo, and is set in rows four and one-half feet apart, and four inches apart in the row; but it takes from six to twelve of
their roots to make one of ours. They get about one cent per root for their celery, and we sell ours for prices ranging from five to twenty-five cents per root.

In preparing for market, every separate root has to be dug, trimmed, knifed, washed, and packed. It is usually packed in boxes of three dozen in each; but the Arlington will almost always fill with two and one-half dozen. It cannot be grown (counting every root) for less than four cents per root, and leave any profit to the grower. It is sold by market-gardeners at wholesale, by the box of two and one-half or three dozen, the price varying from one dollar to six dollars.

Chicory (Chicorium Intybus) is generally grown for the roots, which are used for adulterating coffee; but sometimes the plants, when about a foot high, are tied together at the top, and then earthed up to bleach, like celery. When so treated they make a good salad. The seed should be sown early in the spring, in drills fifteen or eighteen inches apart, and half an inch deep. The plants when well up should be thinned to six or eight inches. It is a poor crop to introduce on a farm, or in a garden, for if allowed to go to seed, it will spread all over the place.

Chives (Allium Schoenoprasum) are a small, bulbous-rooted variety of the Onion family; entirely hardy in any part of the United States. Of late years they are
less grown than formerly. Then, no family garden was considered properly stocked without a few bunches of Chives. They require no culture beyond keeping the ground free from weeds, and can be continuously grown on almost any soil year after year without change of location. They are propagated by dividing the root, like Pie Plant, or Rhubarb, and the sets should be put in at ten or twelve inches apart. The leaves or stalks are the edible portion, and may be repeatedly cut off, as they continually renew themselves during the growing season. Sometimes they are used in soups, for flavoring; but more commonly in the raw state, for garnishing. In old-time gardens, chives were often set out as borders for vegetable beds, as they needed no renewing, and their bright green color was quite ornamental.
Field Corn—Traced Ears.

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CHAPTER V.

Vegetables, Etc.—Continued.

**Corn** (*Zea Mays*). The **Common Field** sort is not a market garden crop: yet we cannot leave wholly unmentioned this, the "king crop of the country." The cheap and easily tilled lands of the great West, with the labor-saving machinery lately brought into use, furnish this corn at such low prices that many farmers prefer to buy their supply rather than grow it. But, where there is suitable land that is not too valuable, it is, in our opinion, cheaper in the long run for the owner to grow his home supply.

The soil best adapted to corn is what is generally called "warm" land; that is, a rather light sandy or gravelly loam with a porous sub-soil, well enriched and thoroughly worked.

There is no crop which will respond more quickly to careful and liberal treatment, as is proven by the fact that, within the last few years, so large a yield as 240 bushels of ears has been produced on a single acre; and this was in the Eastern States, where—so our Western neighbors claim—we have no good land. This is, of course, only a single instance, and the large crop was obtained by exceptionally careful culture.
In the Middle States, or in southern localities, it is well to get northern grown seed; which, if carefully selected, is sure to be earlier. Within the past few years some marked improvements have been made in varieties of field corn, which will, no doubt, prove permanent acquisitions; but farmers should not put too much confidence in novelties.

Sweet Corn, also,—unless when grown expressly for extra early marketing,—is too little profitable for a garden crop, and in fact is very little grown by gardeners. The principal sort raised in this vicinity is the Extra Early Crosby,—that being the earliest of all. A strong, sandy loam is its favorite soil. It should be planted, for the early crop, about the first of May. Sow in rows four feet apart, and hills three or four feet apart in the row, according to the condition of the soil. It is usually manured in the hill (besides the broadcasting) with one or two shovelfuls of well-rotted manure. The corn is planted by hand; and, in early planting, should be covered not over one inch deep. Later plantings should be put in deeper. At thinning time four plants should be left in each hill. Clean culture should be given, and the earth should be drawn slightly towards the hills so that water will not stand about the stalks.

If the season should prove favorable, the early crop should be ready for marketing about July 15th. At this date there would be little corn in the market except that brought from the South, and the ears should bring from twenty-five to thirty cents per dozen. At this price the crop from an acre would
bring from $300 to $350. If the Extra Early Crosby is grown, the whole crop may be harvested at two pickings, and marketed before other sorts are brought in to any extent. As an additional advantage, the land is cleared in time for a second cropping. The true early variety does not grow more than three and a half or four feet high.

The "Early Crosby" (an older variety) is a favorite with many growers and private gardeners, as a medium early sort. The Cory Corn is a variety recently introduced, and rapidly coming into favor as one of the best early sorts here cultivated.
The Early Marblehead by some is wrongly considered the first and earliest variety, and is raised to some extent; but the red color of the cob is a most decided objection to it in some markets. The same objection applies to the Early Narragansett, which, before the introduction of the Marblehead, was thought by many to lead all in earliness.

The Early Tom Thumb is a very early, eight-rowed sort, of excellent quality, about a week earlier than the Early Minnesota. The last named sort is much esteemed for the home garden, where a few days in earliness is of less importance than ears of good size and quality.

The Moore’s Concord is a twelve to sixteen rowed sort, not raised by market-gardeners, because it is so late that by the time it is ready for picking the market is flooded. No one can afford to raise it except farmers who have an abundance of land, and to whom the stover is of as much value as the ears. The quality of this variety is most excellent and the ears are large.

Black Mexican is an eight-rowed variety, having ears of medium size. For quality and real sugary flavor it is unexcelled by any variety in cultivation. Marblehead Mammoth is a first-rate large-eared variety, of vigorous growth and excellent quality. Stowell’s Evergreen, the largest and latest of all, is the standard sort, very sweet and of good quality.

Corn Salad (Valerianella olitoria), or Fetticus, is a peculiar vegetable, used entirely as a salad. In England it is largely grown. Some years ago it was very frequently raised among growing corn, but it is now
considered better to give the crop full possession of the land. It is but little grown for the Boston market, but in New York there is quite a demand for it. It should be sown as early in the spring as the ground can be worked, in rows twelve or fifteen inches apart. If the weather is favorable, it should be ready for use in about two months from the date of sowing. When

corn salad, or fetticus.

an early spring supply is to be provided for, it may be sown about the middle of September. The plants should receive a covering of straw, or marsh hay, as soon as cold weather comes. They start very early in the spring, and therefore the covering should be removed in March or early April. The further treatment and marketing are the same as with spinach.

Cress (Lepidium sativum), or Peppergrass, is in some respects like Corn Salad. The culture is very simple.
Sow in early spring, in rows twelve or fifteen inches apart. Make a sowing every ten or fifteen days, as it runs very quickly to seed. The leaves, when young, have a pungent taste and are used as a salad, and also for garnishing. The Curled is the best for general use, although several other varieties are cultivated.

Cucumber (Cucumis sativus). While this is a very important out-door crop, it is also very extensively grown under glass, for the Boston market; and cultivated in this manner (as a forced crop) it is probably dealt in to a larger extent here than in any other market of the United States. Almost every market gardener in this section who has any glass runs it, either early or late, to cucumbers. As is well known, the plant is a very tender one when grown out doors, and when forced under glass is much more so.

The seed for the first crop is generally sown about the middle of March. When the plants are sufficiently
grown they are transplanted, being set four in a hill; and thirty-two hills being put under each 3 x 6 sash. They are left to grow in this manner until they are about four inches high (which usually takes about four weeks from the time of sowing). They are then removed; and each hill is placed under a 3 x 6 sash, and given good, steady heat, such as keeps the ground and roots thoroughly warm. The bed should be kept at an average temperature of about 70°, corresponding to ordinary midsummer weather. The requisite heat is afforded by the heating material that has been placed underneath, aided by the sun, and is retained at night by covering with mats and shutters. It is regulated by means of a thermometer, and ought not to run lower than 50° at night, or higher than 90° during the day. In case the thermometer rises higher than this, the beds should be cooled by raising the sash. The vines are sometimes grown in lettuce beds, after the lettuce has been removed, by putting in fresh heating material, but it is much better, when practicable, to make a fresh bed. The plants, after being established, should be reduced to three in a hill, as it is no advantage, but a drawback, to have too much vine. They require the same care under glass that they would receive in field culture. Especially under glass they are a very quick growing crop, and will require picking as often as four times a week. The picking may ordinarily be commenced about June 1st; and about this time the glass should be removed from the bed. Those gathered in the earliest pickings usually bring about ten cents each; of course as the season advances
the price will decrease, but a hill started at the time stated should bring about $4.00; and later plantings less, according to the season and the supply. The early beds usually continue in bearing until about July 15th, or between six or seven weeks.

There are very few that raise an acre of cucumbers under glass; but where they do, their receipts ought to be, as a fair average result, not less than $3,000.

The plan above described is that followed by most growers, as comparatively few have hot-houses; but by the method of house-culture cucumbers may be grown at any time during the season. Where crops are to be grown for continuous supply during the winter, the first sowing is done early in September. Vines of this sowing will come into bearing about Christmas; and at that season of the year cucumbers will usually bring from forty to fifty cents each. Although this is a large price, growing and selling them in this way is not very profitable; it is attended with much risk and uncertainty, and the crops are always very light. The vines are left to bear as long as they continue doing well. Then the ground is cleared off, and another sowing is made, say in January, and its product is ready for picking in April. In the houses the vines are not allowed to rest on the ground, as they do in the beds, but are trained on trellises of various styles. Thus the cucumbers may be seen with all facility during growth, and taken when ready for picking. Where cucumbers are grown exclusively in the houses, only two crops can be raised each winter.

For the first early out-door crop the plants should
Transplanting—Best Varieties.

be started under glass about five weeks before they are wanted for transplanting. Thirty-two hills are started under each 3 x 6 sash; and when the fourth leaf is well out the hills are transplanted to the field. The roots can be saved from disturbance by using a piece of stove-pipe eight inches in diameter and six high, to cut down around each hill; the shovel being then thrust under, and the plants thus enclosed and supported during removal. Where sods can be obtained to plant in they are often used, for convenience in handling; but the supply is apt to be deficient. The rows should be six feet apart; hills four feet apart in the row, and slightly elevated so that water cannot settle on them. At first a close watch should be kept for bugs: plaster or other dust will be effectual in repelling them. Cultivate as for any out-door crop. In the bearing season the cucumbers will generally bring from one to two cents a piece; and the entire crop of an acre, at this price, will amount to $400 or $500. On high-priced land the entire crop should be marketed for the table, as growing for the pickle factories cannot be made to pay. For pickles, the seed may be put in at any time from the middle of June to the 20th of July. They may be planted as close as four feet apart, each way. The pickles are sold by the thousand, at prices which vary greatly.

Among varieties the White Spine is the leading table sort grown for this market, both out doors and under glass. Rawsons's Improved is the best strain on the market, and this I use exclusively, in forcing and in out-door culture, for table use. It grows very even in
size—crisp and good. The Early Cluster is a very popular early variety, which produces cucumbers in clusters. The Green Prolific, a pickling variety, favored by many, has a similar habit of growth. The Boston Pickling is considered the leading pickling variety, and is a heavy yielder. The Long Green is grown here to some extent for family use—more largely in England. The Extra Early Russian is an odd-looking, netted variety, very early.

Dandelion (*Leontodon Taraxacum*) is almost ex-
clusively a Boston market crop. In this vicinity, the demand is such that it is grown by the acre; and, although there is no demand for it at present in other large markets (yet as the consumption here is steadily increasing) it may be safely inferred that its use, like that of celery, is likely to become more general. It, in some respects, resembles endive, and certainly is one of the most healthful of all spring greens.

It should be sown in drills as early in the spring as the ground can be worked. Although it is a very hardy plant, the seed must have very careful treatment, in order to obtain a good stand, and should be covered not over one fourth of an inch deep. The ground
should then be made firm, so as to retain the moisture. In this section they succeed best on a rather light, sandy soil. It does not need to be very rich, or heavily manured. For field culture, the rows should be put one foot apart. The dandelions, when they first come up, are so dark colored as to be almost invisible. A little lettuce seed, say one ounce per acre, mixed and sown with the dandelion, will come up quickly and show the rows plainly. When sown in beds, to be forced, the rows should be six inches apart. Roots may be removed from the field to a hot-bed, and forced; but in any case it takes somewhat over a year from the time of sowing to grow the crop. It is marketed precisely as spinach—thirteen pounds weight is considered a bushel. The price varies greatly. On the forced crop from $1.00 to $2.00 is about the range of price. On the out-door crop, $1.00 is considered high, the usual average being lower, and prices sometimes very low. At fifty cents per bushel, the crop is a paying one. When prices run high the proceeds per acre often reach as high as $1,000.

There happens a failure sometimes in starting a crop. The sowing may be renewed any time before the first of August, and provided it comes up well, and escapes scorching by the sun, the crop will be just as early as one sown in April.

Women and boys are usually employed to gather and trim the plants, and remove a portion of the roots before sending to market, at a cost of about 10 cts. per bushel. The roots are often dried, and in this condition are an article of commerce, being used quite extensively for
medicinal purposes, and in the manufacture of beer; and also as a substitute for coffee.

The Improved French Thick-Leaved is a great improvement over the common variety; and this is now grown almost exclusively. It is a very vigorous grower, and affords a heavy yield of broad, thick leaves.

**Egg Plant (Solanum Melongena).** The seed should be sown about March 15th, either in hot-bed or hot-house, the temperature being kept between 60° and 80°.

After the plants have reached a height of three or four inches, they should be transplanted to four inches apart; and after they have made a stocky growth, to such size as to cover the ground, they should be again transplanted to eight inches apart. Then they may stand, and be gradually hardened off until it is time for setting in the open ground.

The ground should be thoroughly prepared, and well enriched, as they are rank feeders; they also require a good deal of moisture. They should be set in rows four feet apart,—plants three feet apart in the row. The New York Purple is the principal variety grown. Black Pekin is earlier and hardier, but not quite so large or fine-looking. Early Long Purple is an oblong-fruited, early variety, of good quality. The fruit varies somewhat in color, from a very dark purple to a lighter shade streaked with yellow.

**Endive (Cichorium Endivia)** is quite a rarity here; but it may soon become quite a popular salad. In New York and Philadelphia there is quite a demand for it.

Endive requires a good supply of moisture, and should be sown where it will be least exposed to heat.
(1) Green Curled Endive.

(2) Improved Purple Egg Plant.

(3) Black Pekin Egg Plant.
and drought. As it is used principally during the fall months, the main sowings are usually made in June or July, in properly prepared beds, and the plants, after they have reached the proper height, are transplanted to rows two feet apart, with plants at intervals of six inches in the row.

They have to be blanched by gathering up the leaves and tying them together at the top with bass matting, and in a month or six weeks' time (varying according to the season), the plants will be ready for use.

The Green Curled is very hardy, and blanched easily. It is also largely used for garnishing.

The Moss Curled is a newer variety, and somewhat larger. It makes a most excellent salad, and is also very ornamental. The Broad-Leaved Batavian is used to some extent, principally for soups, but is not nearly as good as the curled varieties.

Herbs (Culinary, Sweet, or Medicinal) constitute a class of garden products, of which some mention should be made here. It may be remarked that Herbs in general love a mellow and free soil; also, that care should be taken to harvest them properly, and without exposure to wet. Selecting a suitable day, cut them when lacking a little of being in full blossom, and dry them quickly in the shade in a secure place; after which pack them close in dry boxes or vessels, and keep them entirely excluded from the air. So treated, they can be kept on hand without deterioration until they can be sold to advantage. Still, only a few are raised, though the list is a long one. We select for description a few of the more prominent kinds.
Anise (*Pimpinella anisum*) is a native of Asia Minor, Greece, and Egypt. The seeds are used in medicine, also in the manufacture of liquors, and in some parts of Europe as a spice for cooking purposes. Sow in April or May in a warm, rich soil, in a permanent location.

Balm (*Melissa officinalis*). This plant is a native of Southern Europe. It is used for seasoning, and in the manufacture of certain perfumes. Sow in a warm location, preferably in a deep, sandy loam; though the plant will succeed almost anywhere.

Basil, Sweet (*Ocymum basilicum*) is a native of India. The leaves are used for seasoning, and, to a limited extent, for medicinal purposes. Sow in hotbed, or greenhouse, if practicable, in March or April, and transplant to open ground after the weather is settled. A sandy soil is almost essential.

Caraway (*Carum carvi*). A native of Europe, produces the "caraway seed" which is so universally used for flavoring. The plant is of the easiest possible culture, no care being necessary, but simply to scatter the seed where the growth is wanted.

Lavender (*Lavandula vera*) is a native of Southern Europe; known everywhere, and largely grown in certain parts of Europe for the oil, which is distilled from the flowers, and is used in perfumes. The plant is also quite ornamental and is worthy of cultivation on this account alone. Choose, if possible, a deep, mellow soil.

Marjoram, Sweet (*Origanum marjoram*). This plant is probably a native of Portugal, though found in
other countries of Southern Europe. It is grown entirely for seasoning or flavoring purposes; the leaves and the ends of the shoots being the parts used. Sow early in the spring in any good garden soil.

Rosemary (*Rosemarinus officinalis*) is a native of Southern Europe. Its leaves, when dried, are used for seasoning. The plants may be grown from seed, but the easier mode of propagation is by division of the roots. A warm location should be chosen.

Summer Savory (*Satureja hortensis*). Native of Europe. This is one of the most common of cultivated herbs. The leaves and tender leaf-stalks are used for flavoring, and especially when cooked with beans impart a very pleasant flavor. The seed may be sown in open ground in early spring; or, if desired, the plants
may be started under glass. A light, rich soil should be selected.

Sage, Common (*Salvia officinalis*), is also a native of Southern Europe. The uses to which this herb is put are numerous, and too well known to be enumerated. Sow in spring wherever desired, and thin to six or eight inches apart in the row. A well-drained soil is essential. Give clean culture.

Thyme (*Thymus vulgaris*) is a native of Southern Europe. The leaves and young shoots are used for seasoning. The plants may be propagated either from seeds or cuttings, the former being preferable. Sow in early spring, and in midsummer transplant to five or six inches apart in the row or border.
Horseradish (Cochlearia Armoracia) is raised from sets saved during preparation for market of the previous crop. These are put into the ground as early as the soil can be prepared. Plough four furrows together, and thus form a ridge: along the middle of this ridge the sets are planted by hand, eighteen inches apart, and covered two inches deep. A series of ridges thus formed will bring the rows about three and one-half feet apart. A row of spinach is sown on one side of this ridge, and a row of beets on the other side, leaving the centre occupied by the horseradish, which is very slow in starting, so that the others will not interfere
with it at all. The spinach is cut off early; and the beets, after they have made a proper growth, are thinned for greens, while those that are left to grow are soon gathered and bunched for early marketing. By this time the horseradish will have reached a height of five or six inches, and can now be hoed and cultivated.

Before being marketed for grating, it is washed by putting it in tubs of water and stirring and brushing with a broom. It is then usually packed in barrels.

For bunching, more pains must be taken, and the washing must be a more thorough one; after which it is tied up in bundles of five or six pounds each, and in this way brings a little extra price. By the barrel it usually brings from 5 to 6 cents per pound; each barrel weighing about one hundred pounds.

At the foregoing price, an acre of horseradish, if it succeeded well, would bring a return of about $350. Adding the spinach and beets, the total product should amount to about $600 per acre for the year.
Kohl Rabi (Brassica caulo-rapa) in some respects resembles turnip, but is actually a variety of the cabbage; the bulb is really an enlarged stem, of a fleshy, pulpy consistency. Its shape is that of an almost regular ball; in some varieties about as large as an average sized orange, while in others it is nearly as large as a man’s head. In flavor it closely resembles the turnip, and partly also the cabbage, blending the two. It is highly appreciated in New York, especially amongst the Germans. It is in its best condition for use before it becomes fully grown, even while quite small; and is prepared for the table in the same manner as turnips. The seed-bed should be made in May or June. Transplant to rows three feet apart, fifteen inches apart in the row.

The crop is fitted for market by bunching when green and tender; three bulbs being put in a bunch. The price obtained varies from seventy-five cents to one dollar per dozen bunches. Any that are left unsold may be used for stock feeding. They are often grown expressly for that object. They may be kept as easily as turnips, and the method of storing is the same. The Early White Vienna is the leading variety. It is in the best condition for the table when as large as an ordinary cocoanut. It is then tender and of fine flavor, but later on becomes tough, stringy, and unpalatable.
Early Purple Vienna closely resembles the preceding, except that the color of the bulb is deep purple instead of greenish white. There is but little choice between the two. The Giant White is larger and coarser, and the Goliath is truly a mammoth kind; these are raised only for stock.

Leek (*Allium porrum*) is a hardy biennial plant, producing an oblong bulb, or stalk, which has the flavor of an onion, and is used principally for flavoring soups.
and stews. It is useless to attempt its cultivation on light, poor land. Sow the seed early in May, in a well prepared bed, and transplant in July to rows three feet apart, putting two plants to each foot of row, on land from which a crop of cabbage or lettuce has been removed. Set them rather deep, and in cultivating draw up the earth, so as to bleach them slightly and keep them tender.

The Leek is used principally during the winter months, and may be stored in trenches, in the same manner as celery; or it may be placed in a cool cellar, with the roots resting on a layer of soil. In this way, if standing thickly together, they will take root slightly, and keep very fresh and green until late the following spring.

The Musselburgh is the principal market variety, although the London Flag closely resembles it and is just as good. The Giant Carentan is a newer sort, large and of good quality, and will, no doubt, prove quite popular.

Lettuce (*Lactuca sativa*). This is one of the leading crops, and is perhaps the most profitable one raised by market gardeners. It is the only vegetable that is continuously grown throughout the year, being produced under glass in hot-houses, or hot-beds, in winter, and in the open ground in the summer.

For forcing in hot-houses, seed is sown for plants of the first setting about the first of September, in the open ground; these are afterwards transplanted into the houses. The resulting crop is ready for marketing about the middle of November. Sowings are made
about ten days apart, from time to time, throughout the season, so as to give a continuous supply of plants. Lettuce seed is very small, and when sown under glass requires but little covering. One ounce of good seed is sufficient for four sashes of the ordinary size, three feet by six.

The culture of Lettuce, as an out-door crop, is comparatively easy; but when grown under glass it is a much more difficult crop to raise, as through the winter season, when the days are short and there is much cloudy weather, the crop is likely to be affected with mildew and the green-fly.

This green fly, or louse, is a most difficult insect to manage, especially when the plants have gained a considerable size. The only way to keep rid of them is to fumigate the houses thoroughly with the smoke of tobacco stems. This should be done three nights in succession. In order to make sure of accomplishing the work, in a week or ten days after the third smoking
the operation should be repeated; and by this process, if carefully and thoroughly carried out at the proper times, a crop already attacked may be saved; but it requires thorough treatment. The tobacco stems should be moistened before being used, or the heat will be too much for the lettuce. Some skill and discretion are necessary to determine just how much to moisten them, and how to do the smoking in the proper manner. On these points a practical experience is the very best possible teacher; and although somewhat costly at times, it affords one the most instructive lessons. After the first of February there is but very little trouble with this insect.

After the plants have been treated in this manner they will be ready for transplanting into beds or

wherever required; while if this treatment had not been given them, quite likely they would have been spoiled. Occasionally, it is true, these insects do not trouble a crop at all; but it is much the best policy to be on the safe side and use every precaution.
Through damp and cloudy weather the plants are liable to mildew, both in the houses and in frames. Although not as troublesome as insects, mildew often destroys a crop. This can be avoided by keeping up as high a temperature as possible, while still giving plenty of air. In transplanting lettuce, the plants should at first be put four inches apart; and when they have covered the ground should be moved to eight inches apart in the houses.

In hot-beds, 50 plants are put under each 3 x 6 sash, which makes the distances separating the plants about seven and a half inches each way.

The price for lettuce, through the winter, averages about four cents per single head, or fifty cents per dozen. Three crops can be grown in the hot-houses during the winter. Three can be taken from the hot-beds also, if the plants are started in the houses and grown there until the last transplanting.

The temperature in the houses should be kept between 40° and 45° in the night time, and at from 60° to 70° during the day. That of the hot-beds also should be regulated in a similar manner.

In this vicinity the White Seeded Tennis-ball is almost exclusively the variety raised for forcing; and the Black Seeded is selected for out-door culture, the latter being very much larger than the former.

As we have remarked, the first sowing of White Seeded Tennis-ball is made about the first of September. The Black Seeded is first sown in February, in the houses, and then transplanted to hot-beds. After being hardened off, it is set in the open ground about
the last of April or the first of May, and will be fit for cutting about the first of June. The price for this lettuce is about the same as for that grown in the houses. This is either set in the field, about one foot apart, or is set among cabbage, or in the onion field, where space has been left for a later growth of celery. As soon as the ground can be worked in the spring, a sowing of the Black Seeded variety is made in the open ground; the rows being spaced one foot apart, and every other row being left out so that celery may be set in later. When the plants are large enough, they are thinned so as to stand one foot apart in the row.

Sowings are made in this way every ten days until about the twentieth of August. These sowings, taken with those made under glass, as described, give continuously maturing crops of lettuce the year round.
We have described the White and Black Seeded Tennis-ball; next in order comes the Boston Fine Curled; which may either be forced under glass or grown in out-door culture.

Early Curled Simpson is another excellent curled variety, pale green in color. It does not form very compact heads.

Early Curled Silesia is a very early curled sort, used extensively for first early out-door crops.

Hanson is one of the leading "head" lettuces for out-door culture, and is extensively raised in the home gardens.

White Paris Cos is the best of the Cos varieties. It is a quick grower, and has been rapidly gaining in pop-
ularity for the past few years. The Bath Cos is crisp and fine flavored, and extremely large.

The Green Curled is an exceedingly ornamental, fringed variety, and is rapidly gaining in favor in family gardens.

There is an almost endless list of varieties, but none are more desirable than those above mentioned.

**Martynia (Martynia).** The young seed pods of this plant are used to some extent for pickling. It is of very easy culture, and will succeed in almost any garden soil.

The seed may be sown in the hot-bed,—the plants being afterwards transplanted,—or may be sown in April in the open ground, and transplanted later. They should be spaced to three feet apart each way, as the plants are very spreading in habit.

On good soil the pods are produced in great abundance, and should be ready for use in July or August.
Mushrooms (*Agaricus Campestris*). This is a very peculiar crop, and one that is found in many respects quite difficult to grow. The best plan is as follows: Take fresh horse manure and shake out all the straw and coarse part, using nothing but the fine portion of it. Mix this with fresh loam, one part loam to two parts manure, and turn the pile every day to keep it from burning, until the fiery heat is nearly all out of it. Construct the bed about four feet wide and as long as required, putting in the prepared material about eight inches deep, and making it very solid as it is put in. Let it remain in this condition, until the temperature has become reduced to 90°; then make holes two or three inches deep, at a distance of twelve inches apart each way, into which put the spawn in pieces about as large as a hen’s egg. Cover the spawn and let it remain undisturbed for eight or ten days; then
cover the whole bed with fine loam, to the depth of two inches, making it firm with the back of a shovel or spade. Apply water only when the soil is very dry.

The bed must be in a covered situation, and in a dark place, with the temperature at about 50°, and the prepared soil must be kept dry from the commencement. If everything favors, the mushrooms will appear in six or eight weeks, and will continue over two months. By careful applications of water at the temperature of about 70° the season may be prolonged.

Muskmelon (Cucumis Melo). The Muskmelon will succeed best in soil naturally strong and rich, and on a recently turned sod. The best way is to turn the land over at the proper time and apply about five cords of manure broadcast, using a spreader where one can be had. After harrowing thoroughly, the ground should be marked off for hills, six feet apart each way. A shovelful of fine manure should be applied in the hills, which should be slightly raised, so that water will not stand around the plants. Seven or eight seeds should be put in a hill so as to make due allowance for insects.

After the plants have got their fourth leaf well out, and have obtained a good start, they should be thinned to three in a hill. Cultivate both ways thoroughly, the same as a crop of squash or other vines would be treated. They should never be hoed or worked around when the leaves are wet with rain or dew.

In picking for market, it is an easy matter to tell when the fruit is fit to be taken, as the under side of the melon will be lightly streaked with yellow. If
picked then and exposed to the sun for a couple of days, they will be ready for the table of the consumer. They are rather an uncertain crop, and are cultivated but very little by market gardeners in this section.

The melons of this class are all yellow fleshed. There are several varieties; but the Arlington Long Yellow is almost exclusively the one here raised for market. In shape it is oblong, with a skin thickly netted, flesh thick and of fine flavor.

_Cantaloupe_ is our name for round kinds. These are usually started about May 1st, under glass, to be transplanted, about June 10th, to the open field. The bed is usually placed near the centre of the field where they are to be grown, and the seed started on _sods_ 9 inch by 9 inch, so that thirty-two hills are started under each 3 x 6 sash.

The Arlington Nutmeg is the leading first early variety, and is followed by the Hackensall, which is one of the most popular sorts for the main crop. The latter is of good size and of excellent quality. The Casaba is a large, late variety, and in the Northern States always requires to be started under glass in order to give it time to ripen its fruit before frost.

The Surprise is a variety of quite recent introduction and of considerable merit for the home garden, but it is not large enough for market.
White Japan is quite a popular sort, of most excellent quality. It is of medium size, with skin pale yellow in color, while the flesh is golden.

Montreal Market is the largest melon of its class in cultivation, and derives its name from being originated and largely grown in the vicinity of Montreal. This is started under glass, earlier than the others, and is grown almost entirely in the beds until the time of picking. It is a very thick-meated, green-fleshed sort, and is considered the best sort, for table use, in existence. Good specimens of its fruit, well grown and ripened, often bring as high as $1.00 each, at wholesale. As they produce more vines than the other varieties they must be given more room. Where one
hill is planted under a sash the beds should be set so that the hills will be twelve feet apart the other way. One plant per hill, at this distance, is sufficient. In picking for market, it has to be noted that the fruit is never ripe until the stem will part readily from it.

**Mustard** (*Sinapis alba* and *nigra*). Used to some extent for greens, early in the spring, but more espe-

![Black Seeded Mustard](image)

cially as a salad. It may be sown in the open ground (almost any time after the soil can be properly prepared) in rows twelve inches apart: also may be forced in the hot-bed, or hot-house, and thus may be had at all seasons of the year.

White Mustard is the variety best liked as a salad; and the seed, which is of a very bright yellow color, affords, when ground, the mustard which we use on our tables. Black seeded is much like the preceding,
except that the seed is very dark in color and the leaves are a trifle more pungent. It is used both as a salad and for manufacturing into table mustard.

**Nasturtium (Tropaeolum majus)** is but little grown, either in the market or home garden; but the shoots and flower buds make an excellent salad, and the seeds of the Dwarf variety (*T. minus*) when pickled in vinegar can hardly be distinguished from caper sauce.

It can be easily grown in any garden soil, and will twine around brush, or any other support that may be near. It is sown in drills, in early spring, being covered about one inch deep.

A large number of varieties may be found catalogued in the published flower-seed lists; but the Tall and Dwarf are the only kinds grown in the vegetable garden. The former grows to a height of eight or nine feet; and is a first-rate ornamental plant to set for climbing over rock work or on a trellis. The Dwarf never grows above three or three and a half feet in height; and this, when sown in drills, should be bushed like early peas.

**Okra (Hibiscus esculentus)** is grown for its seed pods, which, when young and tender, are used in soups and stews.

It is of very easy culture, as it succeeds on almost any soil, and after the plants are once up and growing is quite hardy. But the seeds should not be put in till the weather is warm and fairly settled,—say about the 10th of May,—as they are liable to rot if placed in the soil when it is cold and soggy. In this one respect they are very tender, and are found difficult to start ex-
cept under favorable conditions. There are but two varieties on the list; these are the Tall and Dwarf kinds.

In the culture of either, the planting should be in drills, and the covering two inches deep. If the dwarf variety is planted at eighteen inches between the drills, it will have space enough; but in cultivating the larger variety, three or three and a half feet will be none too much room to leave between the rows.

This plant is one which requires nearly the whole season to complete its growth; but, if desired, a few seeds may be started in the hot-bed or hot-house about four weeks before they are wanted for setting out of doors, and in this way they may be hurried forward.

When used in soups, okra imparts a viscous or gummy consistency, and a peculiar flavor which, to most people, is quite agreeable.
CHAPTER VI.

Vegetables, Etc.—Continued.

**The Onion** (*Allium cepa*) as a paying field crop, ranks next to cabbage. For the early supply, grown for bunching, onion sets are used. These should be planted in rich soil, using from six to ten bushels per acre, according to the size of the sets. Seed is also sown at the same time for plants to follow, and maintain the supply. Six pounds of seed are required for an acre. For raising sets, twenty-five pounds of seed are required, which should be grown on rather poor land, so that they may not run to tops or grow too large.

The White sets are put out in the spring as soon as the ground can be worked, three inches apart, in rows one foot apart, reserving every sixth row for celery. This work is usually done by boys, and the sets are covered in with a rake by a man who follows, walking in the vacant row. Only two weedings will be required; but when seed is sown three are necessary, and the plants are thinned to three inches.

The sets will be large enough for pulling about the middle of June. They are bunched for market, five in
From Sets or Seeds.

a bunch at first, and four when they are larger. The pulling continues through July. The price obtained for those first marketed is about sixty cents per dozen bunches, and the average of the whole crop may be from thirty-five to forty cents. The proceeds of an acre should be from $600 to $800, and $300 should cover cost of growing.

Yellow sets do not differ as to culture from the white, but are not used for bunching. Soon after the tops drop over (about July 1st), the onions are pulled up and left to dry on the ground. When they are thoroughly dry the tops are cut off, and the onions are boxed or barreled for sale. The average yield (leaving out the sixth row for celery) is about 500 bushels per
acre, and they will bring a price between $1.00 and $1.50 per bushel. In raising late crops for storing, seed is used exclusively, and the plants are thinned to one inch instead of three. These crops are allowed to dry thoroughly in the ground before harvesting. They should be stored in bins or boxes where a steady, cool temperature can be kept up. For fall onions the price obtained is usually about $2.50 per barrel.

The Yellow Danvers, and the White Portugal or Silver Skin, are the kinds grown almost exclusively for this market, from sets and from seeds. In some localities, where red onions are in favor, the Red Wethersfield is highly esteemed. It is a very productive, large sort.

Parsley (*Apium petroselinum*) is kept at all seasons in continuous growth, either under glass or in the open ground. The plants for forcing are kept cut down dur-
ing the summer, and in the fall are placed under glass, at three inches apart, in rows about six inches apart. The pickings may be repeated often during the season, after which the roots are worthless.

The Fine Curled is the variety chiefly grown, and is in fact the most desirable. The Moss Curled, though similar, is a little more crimped. Fern-Leaved is an ornamental variety. Plain Parsley is the smooth-leaved sort, used mainly for flavoring. It is hardier, and its leaves are larger and of a deeper green than those of the other sorts named. The average returns, per sash 3 x 6, from forced parsley would be from $3.00 to $4.00.

Parsnip (Pastinaca sativa) requires careful attention to secure proper germination. Thorough preparation of soil and early sowing will promote that result. Sow in rows fifteen inches apart. At this width, an early crop of spinach or radishes may be sown in
rows between. These will be out of the way before the
parsnips will crowd them. Make the covering not over
half an inch deep, and thin to four inches apart. Any
convenient part of the crop may be left to stand in the
ground over winter (as they are improved by frost), and
may be dug for marketing any time after the frost is
out. Parsnips will do better (and especially in case
they are to remain in the ground over winter) if sown
on ridges formed by lapping two furrows together, each
ridge planted with two rows. The ridges should be
thirty inches apart.

Peas (*Pisum sativum*), which have been in past years
highly profitable, now yield fluctuating and uncertain
returns, owing to the shipments of Southern growers.
Where cabbage is to follow, the early upright growing
sorts are usually sown in three and a half feet rows.
Three feet apart does well for American Wonder.
When squashes are to follow, two double rows are put
in three and a half feet apart, and then a space is re-
served about five feet wide for planting squashes, before
the peas are ready to be removed.

When a sufficient quantity of manure is available, it
is always best to manure the peas broadcast before
sowing. When manure is applied in this way, the
peas will get as much of it as they need, and the bal-
ance will remain for the later crop. When it is in-
tended to cultivate in this manner, the early varieties
are always sown, as the late ones would not get off soon
enough. Sowings should be begun as soon as the
ground is fit to work, and continue at intervals of a
week or ten days until the first of May.
Rawson's Clipper, a new variety first offered in the spring of 1886, has proved in our trial grounds to be the earliest in cultivation. It is of fine quality; very productive, can all be gathered in two pickings, and is a valuable market variety.

The Daniel O'Rourke is the standard extra early kind, and is the favorite with market gardeners, as the crop may be gathered mainly at one picking. It grows to the height of two and a half feet. The following extra early varieties (as is perhaps generally known) are merely selected stock of the Daniel...
Tall Growing Pea.
O'Rourke: First and Best, Maud S, Early Dexter, Carter's First Crop, and many others which are named according to the fancy of the dealer offering them. The Kentish Invicta is almost as early, and a heavy yielder.

Among the early wrinkled varieties the American Wonder stands at the head of the list. It is very dwarf, averaging eight to ten inches in height, according to the nature of the soil, of the very best quality, and for the home garden at least has no superior for an extra early table pea. Until the introduction of the Wonder, the "Little Gem" was the leading dwarf wrinkled variety, and even now is quite popular. It grows a trifle taller than the American Wonder. McLean's Advancer is one of the leading varieties grown for market and home use, and its great productiveness makes it a favorite with market gardeners. It grows to a height of two feet.

Champion of England is the standard late variety. It is a very heavy cropper, and of best quality. Grows about four feet high. The Black-Eyed Marrowfat is the well known old variety, and grows about the same height and ripens about the same time as the Champion of England. The "Stratagem" is a new medium-late variety, which is rapidly gaining in favor. It yields abundantly, and in quality is excellent. It seems destined to take a front rank as a market sort, being of large size, a heavy yielder, and having the advantage over other varieties of being much easier to pick. The number of bushels of pods raised from a bushel of seed varies from one hundred to one hundred and fifty, and the price usually averages about one dollar per bushel.
(1) Sweet Spinach.  
(2) Sweet Mountain.  
(4) Monstrous.  
(5) Long Cayenne.  
(3) Squash or Tomato-Shaped.  
(6) Cherry.  
(7) Chili.
Peppers (Capsicum) are usually sown under glass about April 1st, and should not be transplanted to the open ground until the weather is warm and settled,—say about June 1st, in this locality. The pickle factories use large quantities, which are grown very cheap on contracts; but our market gardeners raise them in very small lots; merely enough to supply the retail trade.

The Bell, or Bull-Nose, is a large and mild-flavored variety, and is one of the most popular. The Sweet Mountain, or Mammoth, resembles the Bell in some respects, and is, perhaps, just as desirable. The Squash, or Tomato-Shaped, variety is chiefly grown for the pickle factories. It is very productive, and of good size.

Long Cayenne is the strong, pungent variety with which every one is acquainted. It is quite late, and the pods while still young and green are frequently used for pickling.

The Potato (Solanum tuberosum) prefers soils of a sandy or gravelly nature; although it will succeed, to some extent, on all soils ranging between a light loam and a stiff clay, provided there is just the right amount of moisture. But it is worse than folly to attempt to grow potatoes on land that is waterlogged, or not well and thoroughly drained, either by natural or artificial means. A newly turned sod, other things being favorable, forms the best potato land. In our own experience (especially on land that has been heavily manured for previous crops), the use of stable manure, or of wood ashes, somewhat promotes the "scab"; com-
Commercial fertilizers have given us much the smoothest crop. Whatever manuring is applied should, as a rule, be put on broadcast. On some lands, exceptionally light and dry, level culture may prove the best; but we have succeeded better by a moderate hilling up. This seems to keep the land light and friable. Make the cultivator and shovel-plough do all the hilling, and most of the hoeing.

The selection and cutting of seed are important points. We recommend medium sized tubers, cut to one eye. The tuber itself is not a seed, but merely an enlargement of the underground stem, and in planting tubers, either entire or cut, we are putting in (not seeds but) slips or cuttings, in which size is not essential; but probably it is better, as a rule, to use good-shaped medium sized ones.

In a potato tuber held stem end down, it may be seen that the eyes are arranged in regular ascending rotation. For advantageously dividing it to single
Cutting Seed Potatoes.

eyes (as is more especially necessary to those who buy new and valuable varieties), an excellent method is delineated in the cut here introduced. An indentation will be found in each tuber, clearly indicating the stem end. The cuts, to be made with a thin-bladed knife, are all sloped towards it; each cut removes one eye, proceeding, in succession, from the lowest to the highest.
Two or three times, before the crop comes up, a smoothing harrow should be run over the piece, destroying the young weeds as soon as they start. The Colorado beetles, or potato-bugs, formerly so much dreaded, are now disposed of very easily by the use of slug shot, or Paris green: either is sure death to the bugs.

For digging the crop, there is at present no sure and satisfactory implement but the four-tined digging-fork. There is a fortune awaiting the man who invents a completely successful machine-digger.

Varieties are so numerous, and many are so little distinct, that to mention even a quarter of them would be confusing. The Early Rose has an almost endless number of closely related kinds, such as Early Sunrise, Early Gem, Chicago Market, Early Vermont, and others. Present favorites are the early and late varieties of Beauty of Hebron. The Snow Flake is of the highest table quality, but not a great yielder, except in the best land. Whatever variety is most popular should be chosen to plant for market; and soil and cultivation are of far more importance than choice of a kind.

Radish (*Raphanus sativus*). Until within the past few years the culture of radishes has been confined to the open ground; but now the growing of this crop under glass has assumed quite important proportions.

For growing in hot-houses the French Breakfast is almost the sole variety used, as it has a short top, is a quick grower, and of good quality. The seed is sown at any time during the cold season, from October to
April. The crop is usually ready for pulling about eight weeks from the sowing of the seed. The temperature should be kept rather low, say from $45^\circ$ to $60^\circ$. Grown in this manner it will be seen that three crops may be grown under the same glass each season.

The soil required to grow them to perfection is a loose, sandy loam; and it should be well worked, with a liberal quantity of well rotted manure thoroughly mixed in. The seed is sown in rows about four inches apart; and the plants are thinned to about two inches apart in the row. When about three-fourths of an inch in diameter, they are pulled and bunched, ten in a bunch. The price varies from fifty cents to one dollar per dozen bunches; but, even at the smaller price they are considered a profitable crop.

When grown in hot-beds, the Short Top Long Scarlet is preferable to any other. It is usually grown following a crop of lettuce; as, when the lettuce has been grown the heat is then nearly spent, and the loam is in
just about the right condition for growing a crop of radishes. It is more suitable than a fresh bed; which would be likely to stimulate an excessive growth of the tops.

They are grown in rows four inches apart, and thinned to three inches in the row; as this variety (being, when pulled, about the size of clothes-pins) will not so well bear crowding as the French Breakfast. Sometimes a crop of carrots is grown with them; and, when this is done, every third row is left out for the carrots. After the radishes are taken off, the carrots will occupy the ground to advantage. The glass can be taken from the bed early in the spring and used for some other crop.

In some sections the turnip variety is grown, similar methods of culture being employed; but, for the Boston market, those previously mentioned are raised almost exclusively.

For out-door culture the long-rooted variety is the one chiefly selected. This also succeeds best on a sandy loam, worked very fine and light. It is usually grown in connection with some other crop. The land being
Later Crops—Winter Varieties.

made up into beds about six feet wide, each ridge or bed is sown with about ten rows of radishes and four rows of beets, parsnips, or carrots.

In order to have a succession for constant pulling, it is necessary to make sowings every week or ten days, from the first of April to the middle of June. The radishes must be thinned to four or six inches apart. When pulled, they are put ten in a bunch, and usually bring three cents per bunch, or $3.00 per hundred bunches (as usually sold). At this price the proceeds per acre would be about $500.

The other crop is not touched until the radishes are removed, but after that it may be cultivated.

Besides the varieties which we have mentioned, the following are grown to some extent in home gardens and for special consumption, viz.: Early Scarlet Olive-shaped (a very good forcing variety, good also for out-door culture), and Wood’s Early Frame, which is somewhat similar to the Long Scarlet, though shorter, and is an early and quite a popular sort.

The winter varieties are but little grown. The Black Spanish and Chinese Rose Winter are the leading ones,
and when grown for winter use should be stored in sand, in order to keep them fresh.

Rhubarb (*Rheum hybridum*) is now quite extensively grown, both in field culture and forced under glass. A few days' time lost or saved in getting into market often makes a difference of one half in price. The first pulling of the out-door crop is usually made the last of April or the first of May, and the plants continue to furnish a supply until about the first of July. It is put up in bundles which vary in weight between 15 and 40
Rhubarb—Salsify.

pounds, according to the advance of the season, and is sold entirely by weight, the average price being from one to ten cents per pound, and average returns $300 to $400 per acre. The crop is forced either by setting thickly in hot-beds or hot-houses, or by leaving roots about three feet apart in the ground where they have grown, and setting cold-frames over them. The glass is put on about the 1st of February. The price on the forced crop varies even more than that of out-door growth; but $5 is a fair estimate of returns from each 3 x 6 sash. The two varieties mostly grown here are the Linnaeus and Victoria—the former is the better kind, though both are good.

Salsify (Tragopogon porri-folius). The culture of this vegetable, although limited, is increasing. The crop will succeed best on a light, sandy loam, well enriched and thoroughly worked before sowing. The after culture is much the same as for carrots or parsnips. The spring supply may, if desired, be left in the ground over winter, as the roots are not injured at all by freezing. In marketing, the roots are tied in bunches
of twelve each, none but good shaped ones being used. There is but one variety, although there is much room for improvement in size and smoothness of root.

Spinach \textit{(Spinacea oleracea)} is fast becoming one of the leading crops of our market gardens, being sold and used during the whole of the year. For winter use it is usually brought from the South. The crop that comes early in the spring is usually sown about the first of September, and at the beginning of winter is protected with a covering of hay or boughs. This crop generally lasts until about June 1st, when that which has been sown in the spring will be ready for marketing.

It is sold by the bushel. The receipts of an acre when the yield was generally large would be about \$200, while if the crop was scarce it might reach as high as \$1,000. In spring culture frequent sowings are usually made to furnish a continuous supply.
The crop will bear a liberal amount of manure and for the fall-sown crop a dressing of about seven hundred pounds Sulphate of Ammonia is usually given in the spring.

For the first spring sowing the round, thick-leaved is used, and for later use the Long Standing. In sowing for spring cutting the Arlington is the favorite as it is choice and hardy. The Savoy-Leaved is a curled sort of good quality, and very ornamental in appearance.

Squash (Cucurbita melo-pepo) is very largely cultivated for all markets. As it is a tropical plant, in Northern latitudes the season is too short for maturing the later varieties.

There are two quite distinct kinds—Early Bush and Running; the last-named being later. The Summer Crookneck and the Bush Scallop belong to the former. The cultivation of both these varieties is the same. Plant in rows six feet
apart, with hills four feet apart in the row. If the weather at transplanting favors, a week's time may be saved by starting under glass. They mature with us about the 4th of July. In some localities the Bush Scallop is preferred, but in the Boston market the Crookneck is more sought for.

The Early Marrow is planted about the same time, and matures about four weeks later. The hills are put nine feet apart each way; with a liberal amount of seed in each hill, as the plants are just coming on in the height of the bug season. Cover the seed about one inch deep. Manure with about six cords of stable manure per acre, mainly spread on broadcast, but put one shovelful in each hill, and with the latter mix one shovelful of coal ashes, to protect them from the
Best Keeping Varieties.

borers. When planted with spring greens on ground manured with twenty cords per acre, the dressing in the hill may be omitted. The dark, oblong-shaped Marrow is a very salable sort, on account of the color; but its keeping qualities are very poor. The true Boston Marrow is light-colored and quite round, and when planted late will keep almost as well as the Hubbard.

Next in order comes the Turban, which is followed by the Essex Hybrid. The two are nearly alike in appearance, the only difference being that the Hybrid has a hard shell. The Hybrid is much the best keeper, and is also of better quality. As these varieties make more vine than the Marrows, they should be planted as much as eleven feet apart each way.

They are often put in with a crop of beans or peas, two rows of peas or beans being cultivated in each interval between the squash rows; and these can be har-
marketed soon after picking; but the Hybrid may be kept well into the winter.

The three latest varieties are the Hubbard, Buttmans, and Marblehead; of which the first is almost universally preferred. When picking for storing great care should be taken not to bruise them or break off the stems. They are brought from the field in wagons and put in piles, to remain until quite dry, and then stored in an even temperature as near 50° as possible.

Squashes are sold by weight, with exception of the summer varieties. These are sold by the dozen. The price obtained is very variable. None of the varieties are accounted a paying crop unless they bring at least fifteen dollars per ton.

The Tomato (*Solanum lycopersicum*) is now very extensively grown, and of late there has been a great improvement in varieties, not so much in respect of earliness, perhaps, as in size and quality. And certainly there can be nothing much more perfect and handsome than the well-ripened fruit of some of our leading varieties. In order to induce a stocky growth, the young plants are twice transplanted. The second transplanting should be made before the plants commence to crowd and grow spindling, and this time they should be put eight inches apart. This last transplanting is always made in hot-beds, but the first is usually made in the house; the plants being put four inches apart.

About the 25th of May the plants sown the middle of February may generally be set in the open ground; and should be planted in rows six feet apart, with plants
five feet in the row. The tomatoes usually follow a crop of spinach; and but little additional manure is applied except in the hill; five or six cords per acre are usually put on where the crop does not follow spinach; but merely for hills about two cords will be sufficient, and will push the crop along wonderfully.
The illustration shows what is called "hoop-training." Of course, market gardeners who cultivate tomatoes by the acre will have no time for this sort of thing; but we speak of it with reference particularly to the kitchen garden, where space is sometimes quite an object. A glance at the illustration will show how it is done,—drive three stakes and fasten barrel-hoops to these. It not only keeps the vines in shape, but also prevents the tomatoes from lying on the ground.
In this locality the first picking is often made by the middle of July, and at that early date usually brings a good price, sometimes as high as ten dollars per bushel; but the market soon declines, and often falls below paying prices. The average product of an acre may be reckoned at about $400.

The varieties are numerous, but there are few of real merit. Rawson’s Puritan has been grown by us for several years as a leading early variety, and has not
only proved to be one of the earliest, but one of the most profitable as a market variety. The Cardinal is a promising new sort, early, of large size, very smooth, and in every way desirable. The Acme was for a time a leading sort, and although it rots badly is very desirable where it can be grown. The Mayflower is highly recommended as a very early, smooth sort, equally desirable for market or home use. Livingstone's Favorite and Perfection are two most excellent sorts, and are both good shippers and not liable to rot or crack. The Emery is the first early market variety, of good size and quality;—but of course the very early sorts cannot be expected to be as solid as the later ones. Only leading varieties are here mentioned.

Turnips (Brassica rapa). This crop is not very extensively grown in the market garden, as the demand is quite limited. The flat varieties are the only ones cultivated for early marketing.

The soil best adapted to the crop is a sandy or gravelly loam, well enriched and thoroughly worked. The seed should be sown as early in the spring as the ground can be worked, in drills about fourteen inches apart. After the plants have reached the proper size, thin to six or eight inches apart in the drill. By the last of June, in ordinary seasons, they will have reached the size of an ordinary "Boston cracker" and are then ready for bunching.

They are tied five in a bunch and marketed in the same manner as early beets. The Early Milan Purple Top and the Early Purple Top Munich, which closely resemble each other in most particulars, are the princi-
pal sorts raised for early bunching, and are certainly as good as any.

The proceeds per acre of a good piece of turnips is about the same as of beets, and the cost of raising is about the same, but on the whole they are not as sure a crop as beets, as they are quite liable to become rough, scabby, and wormy, and consequently worthless.

For fall use, the seed may be sown any time from July 1st to August 20th, and they are often sown with grass seed, using about half a pound per acre broadcast with the grass. Grown in this way, their leaves serve as a protection and a help to the grass plants as soon as they commence to start.

The fall crop is marketed by the bushel, either in the fall or during the winter as wanted, and may be stored either in cellars or pits. For this crop, the Purple Top White Globe, the White Top Strap-Leaved and the Red Top Strap-Leaved are quite desirable varieties.

The Ruta Bagas are almost wholly grown as a farm
crop, as they are not sufficiently profitable for the market garden. These may be sown any time during July, and are often used to follow after a crop of cabbage or peas. Sow in drills eighteen inches apart, and thin to one foot apart in the row.

There are no better Ruta Bagas than the best strains of White Sweet German, which are almost universally used both for marketing and home use. The White French, or Rock, is a long, oval turnip, very mild and sweet; the flesh is solid and white, like the German.

The London Extra Yellow Swede, and the Shamrock Yellow Swede, and Carter's Imperial, are the leading yellow-fleshed sorts, and are quite similar to each other in appearance.

**Watermelons** (*Cucurbita citrullus*) are but little grown except as a farm crop, and where land is cheap. They can be readily handled and bear shipping well.
Watermelons—Desirable Sorts. 177

What is known as "warm land" is to be preferred for this crop. The soil should be of a sandy or gravelly nature, and it is not important that it should be very rich. Plant as soon as the weather becomes settled; ordinarily about the middle of May. Cover about half an inch deep and press the soil down firmly so as to hold the moisture. Two shovelfuls of manure should be put in each hill, or one in the hill with a light dressing on top. The intervals should be eight feet each way. Five seeds are put in each hill, and the plants, after being well started, should be thinned out so as to reduce the number to three. They require the same cultivation as squash or any other field crop.

Black Spanish is an old reliable variety, very hardy and productive, and excellent for cultivation. The
popular Mountain Sweet is a very large oval variety, with striped skin and thin rind. Phinney's Early is a very extra early, medium sized sort; excellent for the home garden. The Vick's Early is very similar to it, but perhaps not quite as large. The Gypsy or Rattlesnake, a favorite market variety, is oblong in shape, color light green, beautifully striped and mottled. Kolb's Gem, or American Champion, a variety of recent introduction, is also highly esteemed as a market variety. It carries well, and is of extra firm quality. The Iron Clad is a favorite market variety in many localities. It grows very large and is a good keeper.

Scaly Bark.—This variety is distinguished by its rough skin. The rind is unusually thin, but very tough, and it bears transportation to a great distance without
The well-known Citron Melon is raised entirely for preserving and is wholly valueless otherwise.

**Yam, Chinese** (*Dioscorea Batatas*). Although this vegetable has been cultivated in this country for several years, it has not been extensively advertised, and for that reason has not obtained the popularity which it merits. It is really one of the most valuable esculents in cultivation. The plant when growing unsupported is of a creeping habit, similar to the sweet potato, but it makes a very pretty climber for screens and trellises. The vine will grow to a length of from ten to twenty feet, according to soil and location. The leaves are very dark in color, and heart shaped; the flowers are small, white, and grow in clusters. The root is of pale russet color, oblong; regularly rounded, club shaped, largest at the lower end.
The roots, cut in pieces an inch long, or bulblets, should be planted at eight inches apart. A deep, light
Characteristics — Propagation.

soil, moist and well-enriched, is best adapted to the plant. A well-grown root, two years from the bulblet, should measure two feet in length. They may be cooked either by steaming or roasting; and the flesh will be found very white and of most agreeable flavor.

It would be impossible to find a plant of easier culture, as the roots are perfectly hardy, and can be kept growing year after year in the same location if desired. There is no insect that troubles either the vine or tuber, and no vine can exceed it in vigor of growth. They increase naturally from the small tubers, or bulblets, which form along the vine just above the leaf joints. These should be gathered in the fall, and protected against freezing during the winter. They may be planted any time during the spring, after danger of severe freezing is past. The flowers have a peculiar cinnamon-like fragrance; hence the name "Cinnamon Vine," under which some dealers have sent it out.

When grown in the garden, and merely for the tubers, the vines may be allowed to run on the ground; but if bulblets are desired, these will be produced in greater abundance when poles or other supports are employed to keep the vines up from the soil.
CHAPTER VII.

FARM IMPLEMENTS—REMEDIES OR PREVENTIVES OF DISEASE—CONCLUSION.

MATERIAL improvements have been made within the past few years in agricultural implements, and many of the tools which are now used in the market garden and on the farm are either of recent invention, or entirely different in style and quality from those which were in use only eight or ten years ago; although some of the more common ones, such as are required and in use by every farmer and gardener—hoes, rakes, forks, spades, etc.—have but little changed.

There is a considerable opportunity for choice, even amongst small tools of almost the same pattern and make. No good shoveler is quite satisfied unless he can have his own shovel to work with—it fits his hand better than any other. Hoes and forks have their peculiar merits and demerits, such as can hardly be accounted for upon a cursory examination, but in long continued use become apparent. All these, however, involve but little outlay, and their possible peculiarities are, therefore, of less importance to be discussed; but of course the clumsy ones should be avoided, or discarded as soon as convenient; and better ones should
be watched for, and secured as soon as obtainable. All agree in advising use of the best tools. Good tools make cultivation easier, and crops better in amount and quality. There should be a tool-house, which should also have an outfit for making small repairs. Tools after use should be immediately returned to place. They should always be cleaned off before being left; iron and steel parts should be wiped and oiled, or treated with some more thorough dressing, according to their liability to rust, and the length of time they are likely to remain unused.

We have seen that the first requisite in preparing for a crop is to pulverize the soil; and since the Plough is very efficient for this service (and in fact quite indispensable), it is manifestly one of the most important of agricultural implements. Amongst so many varying

(1) One-Horse Landside. (2) Medium Two-Horse Landside.
Ploughs for Special Uses.

styles, and different manufacturers competing for preference, it is a natural question to ask which is the best. There is no complete answer that can be given to this inquiry. Nearly all of the leading styles are of practical use, and each has its own peculiar and individual merits. In certain soils and for certain purposes, one kind of a plough will often be found to do the work and answer the purpose in view better than another, while, under different conditions, the latter might be decidedly the more serviceable of the two.

All the different makes now in favor are good, and some are known to be specially adapted to certain kinds of work. For example, a mould board that lifts and turns the slice very gradually will operate easily, and turn the bottom-side uppermost with the least possible disturbance of the earth; — a shorter mould board
with a quicker twist will stir and pulverize the soil. No one need have any difficulty in finding one which will serve his purpose when he knows what he wants.

Sulky-ploughs, and sulkies attached to ordinary ploughs, are well adapted for use on level land, when a large amount of work is to be done. (See cut p. 185.)

The two-horse land-side plough (two sizes of which are shown amongst the last preceding illustrations) is

Two-Horse Swivel.

the one most used. Even in this class, different makers have different styles, and each claims for his own that it is the best; but every cultivator should judge for himself which is the best adapted to his needs, and endeavor to confirm his judgment by actual trial, before purchasing. Much use also is made of the swivel plough. The large-sized pattern here shown is chiefly designed for breaking up sod land. It would rarely be needed for this use by market gardeners, but is occasionally required for various other services. A small, or one-horse swivel plough, is often found very
Various Patterns Required.

convenient, especially in ploughing close to fences. Wherever the land needs to be thrown all one way the swivel pattern comes into requisition.

The different patterns of ploughs which should be provided include one very large and one of medium size (both land side), and also a sub-soiler, of which the form and operation may be understood from the cut here inserted. Each of these is to be worked with two horses. As already said, where much ploughing is to be done, a sulky is very useful. Provide also one (side-hill or) swivel plough for one horse, two single (or one-
horse) land-side ploughs, and a very small one with double mould board, suitable for going between narrow rows — one which will throw up the dirt but very little.

Next, perhaps, in importance to the plough comes the Harrow. Of harrows, there are almost as many styles as of ploughs. The cheapness and solid construction of the primitive A harrow are about all it has to recommend it, although it can be used as a "scarifier" now and then, as well as anything else; and at the first coming up of crops planted in rows (as explained on page 62), it can be adapted by a little ingenuity to a very useful purpose.

It is evident, on referring to the cut here presented of the Geddes or jointed harrow, that it will do the
same work as done by the A pattern; and much more expeditiously, and thoroughly; requiring, it is true, more power from the team, but not in full proportion to the increased work accomplished. Its jointed or hinged construction is favorable to its use on uneven ground, but is not especially advantageous in any service the market gardener is likely to require.

For pulverizing the soil following the ploughing the La Dow disk or wheel harrow is by far the best. Its merits have been recognized in reports published by the United States Commissioners of Agriculture; and there are said to be many thousands of this form of harrow now in use in this country and abroad. The inventor furnishes the following description: The disk gangs, being united by a series of universal joint boxes, allow each part to accommodate itself to uneven surfaces. Working in a hollow or dead furrow, or over ridges and obstructions, the disks adjust themselves to the surface over which they pass, cutting an uniform depth, and drawing more easily than if the gangs were rigidly connected. The inner disks of each gang are brought near to a cutting edge with each other, throwing the loosened earth in opposite directions outward, thus escaping the ridge in the centre, which has been a great objection heretofore.
Both gangs of disks stand at a relative angle to each other, thus overcoming any tendency to work sidewise to the line of draft. The driver can, without leaving his seat, change the angle of both gangs at once, by means of the hand lever, and instantly fasten them at any desired angle. The journals are protected from dirt and provided with self-feeding oil cups, and the whole harrow being of iron (except the pole and seat-standard) will bear exposure to the weather without injury.

The construction is such as admits of any part being easily removed or replaced; and, in connection with the system of bracing employed, renders this the lightest, easiest handled, and strongest Disk Harrow on the market. This harrow is certainly one of the best in use at the present time. It is very strong and durable, and does the work in the best of shape. It pulverizes the land and works it to a depth of about six inches, which is nearly the maximum depth that we plough for putting in crops. For breaking up the lumps on ground that has been trodden hard it has no equal. But where smoothing the surface is the object mainly in view, a "smoothing harrow" should be used.

The Meeker Smoothing Harrow is employed either for leveling the surface of land, that it may be ploughed evenly, or after the ploughing to prepare it for the seed sower. The frame is square—six feet eight inches by six feet one inch—with four sets of rollers, having on them fifty-eight disks of eight inches diameter. On the two forward rollers, the disks are six inches apart, and on the two rear rollers, three inches apart. The
disks on each set of rollers work between those of the other. The board in the centre is set at an angle, is

adjusted up and down, and acts as a leveller. The disks grind all lumps so fine that seed must come up. It mashes small stones below the surface better than any field roller; and levels the ground at the same time, which a field roller does not do. When the object is to prepare for the seed-sower, the smoother should be driven first across the piece to make it level, and then lengthwise, conforming to the direction in which the rows are to be planted. It does its work rapidly and well, and saves time and labor in the use of hand-rakes.

For completing the preparation of the soil, prior to planting, the Roller next claims our attention. The nature of the service it performs has already been treated of in our preceding chapter on soil-preparation. The cut on the following page exhibits the style and construction of a good Roller. The revolving portion is formed in sections, so that it turns without dragging; and the frame carries a box which may be loaded with stones at discretion, to increase the weight whenever required. We desire to insist strongly upon the need of making more use than is ordinarily made of this very important implement.
One Horse Sectional Field Roller.
24 in. diameter. Weight, 1,350 lbs.
Next in order of usefulness comes the Cultivator. After the land has been ploughed, subsoiled, harrowed, rolled, and planted, this serviceable implement is called into requisition. It executes with thoroughness, dispatch, and economy a large amount of work that used to be laboriously performed with hand-hoes. Many varieties are offered to choose from, and the choice I recommend may not accord with everyone's individual opinion, but I consider the Planet, Jr. (see cut p. 194) on the whole the best I have ever seen; principally because it can be put into so many different shapes, by varying the combination of its parts, and thus so many different kinds of work can be done with it.

It stirs and pulverizes the ground, destroying weeds, giving aeration, and promoting moisture about the roots of the growing plants; it will throw the earth to or from the rows as may be desired; it does pretty much all that can be done with a hand-hoe in cultivating the crop. Many who are using this implement to-day do not hoe their crops at all by hand work. It requires discretion and skill to obtain such effective results from its use, but there is no question that, in the hands of one who thoroughly understands its capabilities, it can be made to do, at a greatly reduced cost, a large amount of hoeing formerly done with the hand-hoes.

Besides being economical on the score of expense, it is also highly advantageous in enabling the far more rapid execution of the work. Crops often suffer for want of a timely stirring of the soil, especially in times of drought; weeds must be cut down as soon as they
show themselves; even when neither weeds nor drought threaten the crops it is beneficial to the soil, and thus to the growing plants, that it should be turned or stirred as frequently as may be, to give it life. Hand labor is manifestly unequal to carrying out work of this description: it costs too much, and goes over too little ground in a day.

The implement shown in our illustration, under the name of Planet, Jr. Cultivator and Coverer Combined, meets the exigencies we have described in a thoroughly satisfactory manner. No farmer or market-gardener can afford to dispense with this or some equivalent form of cultivator. It combines in a single machine, the Horse-hoe, Cultivator, Plough, and Coverer. The side-hoes or plates are reversible, thus giving double wear; and the standards have adjustments that allow more or less hilling, and also regulate the depth, in conformity with the object or purpose for which it is to be used. This adjustability is a most important feature, in suiti
its use to various soils or crops, or to various stages of growth. That position of the standards or hoes which is shown in the illustration, is the one which casts the earth toward the rows; but whenever the opposite result is aimed at, it can be arranged for by merely changing their positions, putting each on the opposite side, the work of a few moments only. Although the present is an age of improvements, and predictions are always rash, I consider it next to impossible that this implement will be superseded or very much improved upon.

The Hand-hoe most used by market-gardeners is one rather wide and thin, say ten inches by four inches for the blade; and on light sandy land, such as they quite generally have in cultivation, one of this description will be found very much to be preferred. The Shovels used are of two kinds, one with short handle and square blade, the other with a long handle and round point. The former is always employed for putting the heating material into hot-beds, the square part being convenient for making the bottom of the bed smooth and even. The long one serves best for banking celery and ordinary work around the fences and buildings. The Spade
is a tool that is little used except to dig horse-radish and roots, and occasionally for digging celery when it is large and cannot be thrown over with the plough.

The Six-tined and Five-tined forks are the ones most used for pitching manure, digging in hot-beds, and all the work done with a fork.

The Slide-Hoe is used mostly between the rows of beets, lettuce, spinach, onions, dandelions, parsley, celery, and all the crops sown by machine. This tool is made in different widths so as to fit the varying intervals between the rows for which it is intended. The smallest are four inches wide, and they are made to range upwards to twelve inches. They are used by sliding them in a direction parallel with and along the row, and the knives enter the soil to a depth of about one inch, making the land loose and light on the top, and destroying the weeds.

The Little Gem Wheel-Hoe is a hand implement,
Market Gardening.

combining some of the characteristics of the horse hoe, or cultivator, and the slide hoe; thus producing a very serviceable tool. It is well-proportioned, as regards size, to the work to be done; built light and strong; all iron and steel, except handles; well made, and handsomely finished, and adjustable in every way. It is made with single wheel, for use between the rows; and also with double wheel, for use astride the rows.

Arlington Seed Drill.

The Seed-Sower or Drill, is one of the most useful and labor-saving implements in the entire outfit of the market garden. It is used to sow nearly all kinds of seed. Even peas and beans are ordinarily sown by this machine. The quantity of seed sown is regulated by small tins, with holes affording passage for the seeds to the exact amount required, and the distance between rows is regulated or marked by a chain which is made to drag from an adjustable arm. While one row is being sown, the next one is marked by the chain. The adjustable arm is a stick pierced with little holes, and placed across the handles of the machine. The depth of the sowing is regulated by raising or lowering
Seed Drills—Field Marker.

the tooth which ploughs a little furrow for the seed to drop in. The seed may be sown from one-fourth of an inch to three inches deep, and is covered by two little blocks, so arranged as to draw the dirt over upon the seed. This is followed by a roller, which is regulated by a spring so as to roll heavy or light as may be desirable. The machine represented in the illustration is called the Arlington seed drill. It is altogether the best one ever seen by me, and every one who has it in use approves it highly.

The Little Gem drill is small but efficient. It was devised in response to a general desire among small gardeners for an inexpensive drill which will do perfect work; and it satisfies this demand completely.

RAWSON'S FIELD MARKER is a very useful tool. It will work either ten, twelve, twenty or twenty-four inch intervals by simply changing the pins in the wheel, which are put in with a nut. It requires no line, unless you are very particular, and it will mark as fast as a man can walk. It is found especially useful in
setting out cabbage, cauliflower, celery, lettuce, etc.

After once using this implement, no farmer will be willing to be without one.

The two Markers intended for lettuce, and shown in the next cut, are used in marking the beds for lettuce to be grown under glass. One marks five rows—one under each row, or light of glass, when there are five lights wide in each sash of six inches each. The other is then used to mark ten places for plants in each row, thus making fifty plants under each sash. The
bed is prepared with the sash off, and when the sash is to be put in place over the bed, each space is marked by the two men putting on the glass—the one on the lower, or front side, using the one with the handle, and the man on the back side using the other marker.

The marker with ten teeth, next represented, is for sowing radishes or cabbage or 'tuce seed. Mark

the rows by drawing the teeth from the back side of the bed towards the front, bearing down so as to make the furrows deep, if required: and always making the first tooth of the marker follow for a guide the row just made by the last tooth, thus making nine rows under each sash four inches apart.

The Cabbage Carrier is very useful. It is light and
durable, and can easily be carried between the rows of cabbages. It is made of such size as to hold all that two men will want to carry.

In transporting produce to market, a very substantial wagon is used. As regards construction, it corresponds in some points to those ordinarily used in the city for moving heavy furniture, or for heavy express service; but is rather more strongly built than most of these, and is mounted on four strong elliptic steel springs instead of three.

Heat Radiators.—In the glass-roofed winter market-gardens now carried on, extensive use is made of hot water or steam radiating pipes, as well as of steam for pumping. On my place there are three steam pumps, and I have five boilers. At some times the latter are all in service together, mainly for heating.

No attempt will be made here to enter into an account of the methods in use for this purpose. It is a very extensive and intricate subject — one which should
be long and carefully studied before you attempt to do anything involving outlays. The only safe rule is to go slow—and make sure you fully understand everything you undertake.

The Pumping Apparatus illustrated by the foregoing cut is the one alluded to in Part I, on page 24, in connection with the subject of "Irrigation."

Remedies and Preventives of Disease in Plants. Amongst the various forms of disease in plants, we recognize two distinct classes; one due to the presence of animal parasites,—insects and their larvæ,—the other including smut, mildew, blight, rust, and similar fungoid, or vegetable parasitic growths.

It is not always certain to which of these two classes the trouble belongs. Some believe it is an insect
which causes the "blight" in celery; but I do not agree with that view. I know an insect does appear on the leaves when they begin to decay; but on almost every different kind of decaying vegetation some one insect peculiar to it is apt to appear—being invited by the decay, but not the occasion of it.

And often when the insects have made their appearance and the leaves are already yellow, if there is a sufficient application of water, either by the occurrence of a heavy rain or artificially supplied by irrigation, the insects will disappear, the yellow leaves will drop away, and the plants will grow healthy again, with a good crop as the result. The renewed vitality of the plant enables it to cast off the parasitic enemies which would otherwise have joined forces and eaten it up.

This view points us to the main remedy or preventive of all disease,—and more particularly the chief preventive against every form of vegetable parasite, viz.: clean and nourishing culture. In the outset this is the means, and the only means, to be relied upon. This is the first requirement; of course there are others. Hurtful conditions may be noted and avoided. Mismanagement of heat (or moisture) on forced crops frequently entails a blight. Some harmful element in the soil or fertilizer may cause the plants to languish for a time, and so allow the fungus spores to get a foothold. It is good policy, alike as against the fungi and the insect pests, to put all the vigor we can into the growing plants. We should also remember the great importance of prompt treatment when disease is apparent.

Fumigation has already been spoken of [see p. 124.]
Insecticides in liquid solution are used by spraying or syringing the foliage. Either Syringes, Force Pumps, or Garden Engines may be brought into service according to the scale on which the operation is to be carried out.

But there are drawbacks and difficulties in the use of liquid solutions: one is that the poison does not actually dissolve in the water, which has to be constantly agitated to maintain a mixture. Another is the great weight of the quantity required to be used. Dry mixtures are therefore employed, being dusted over the plants. They should be put on preferably when the foliage is still damp after a rain or dew.

A capital implement for applying dry mixtures to field crops is that shown in the following illustration. It is called the "Farmer's Favorite Duster." In operating this device, the left hand is held firm while the
right hand rotates the reservoir of poison and diffuses it effectively.

The well-known Slug Shot is applied with a bellows such as is shown in the cut on p. 196.

Neighbors should combine; and unitedly pursue such measures as are known to be efficient. Due inquiry and better knowledge of facts might do much towards limiting, if not wholly exterminating, each and every kind of parasitic pest. Take for instance the Pea weevil. If all the farmers of the country should unitedly forbear to raise peas for a single year, it would die off completely.

But meanwhile it has been gravely maintained (and
is not very far from the truth) that the whole business of crop raising has come to consist mainly in a contest against insect depredators. These are not discouraged when they find a healthy and vigorous plant growth waiting for them to feed on. Sometimes, indeed, they will sweep off every plant in an early stage of growth; or they may delay their coming till just before harvest and then consume the entire crop.

The Wavy-striped Flea-beetle (*Haltica Striolata*) is very destructive to young Cabbages and Turnips. As soon as the young cabbages appear above the ground it attacks them by eating off the seed leaves; later, when the second leaves appear, the danger lies in another quarter, and it will often be noticed that the plant wilts and changes color. The grub has eaten away the roots.

The same insects that attack young Cabbage plants, and the Turnips, also infest the Radish. In some localities it is almost impossible to grow radishes of a size fit for the table before they are practically destroyed by a small maggot. This maggot appears to be the larva of a fly, closely related to those so destructive to the Onion.

The Imported Onion Fly lays her eggs on the leaves of the young and small onion plants, near the ground. They soon hatch, and the maggots at once attack the bulb. In about two weeks after this a second brood of flies appears, to be followed by more maggots. The remedy consists in removing every infested bulb. These may be known by the leaves turning yellow. They cannot be pulled up by the tops without risk of letting the maggot escape from the decayed bulb. They must be
lifted by a trowel, or an old knife, so as to be sure to bring up the maggot. The bulbs so removed, and the maggots, must be burned.

The Squash and Pumpkin, the Cucumber, and the Melon all belong to the Cucurbitaceae, or Gourd Family. Hence, naturally, the same insects infest all these related plants. The Squash Bug is one of the worst and most disagreeable. When handled or disturbed, it gives off a very repulsive odor. The insects are quiet during the day, but at night lay their eggs in little patches, of a brownish yellow color, and glued to the leaves. They are quite easily kept under control by handpicking.

Conclusion.—In concluding this Market Gardening Manual, I wish to repeat and enforce what I said in the beginning: Success in market gardening demands intelligence, diligence, and natural aptitude. Personal diligence and natural aptitude are matters outside the scope of any manual; but an Intelligent Cultivation of the various crops under all the varying conditions of the business can, of course, be promoted greatly by referring to the experience acquired by those who have succeeded in it.

I therefore submit this book to the public with the conviction that it meets a real demand, and will answer a useful purpose.