



**SUCCESS IN
MARKET GARDENING**





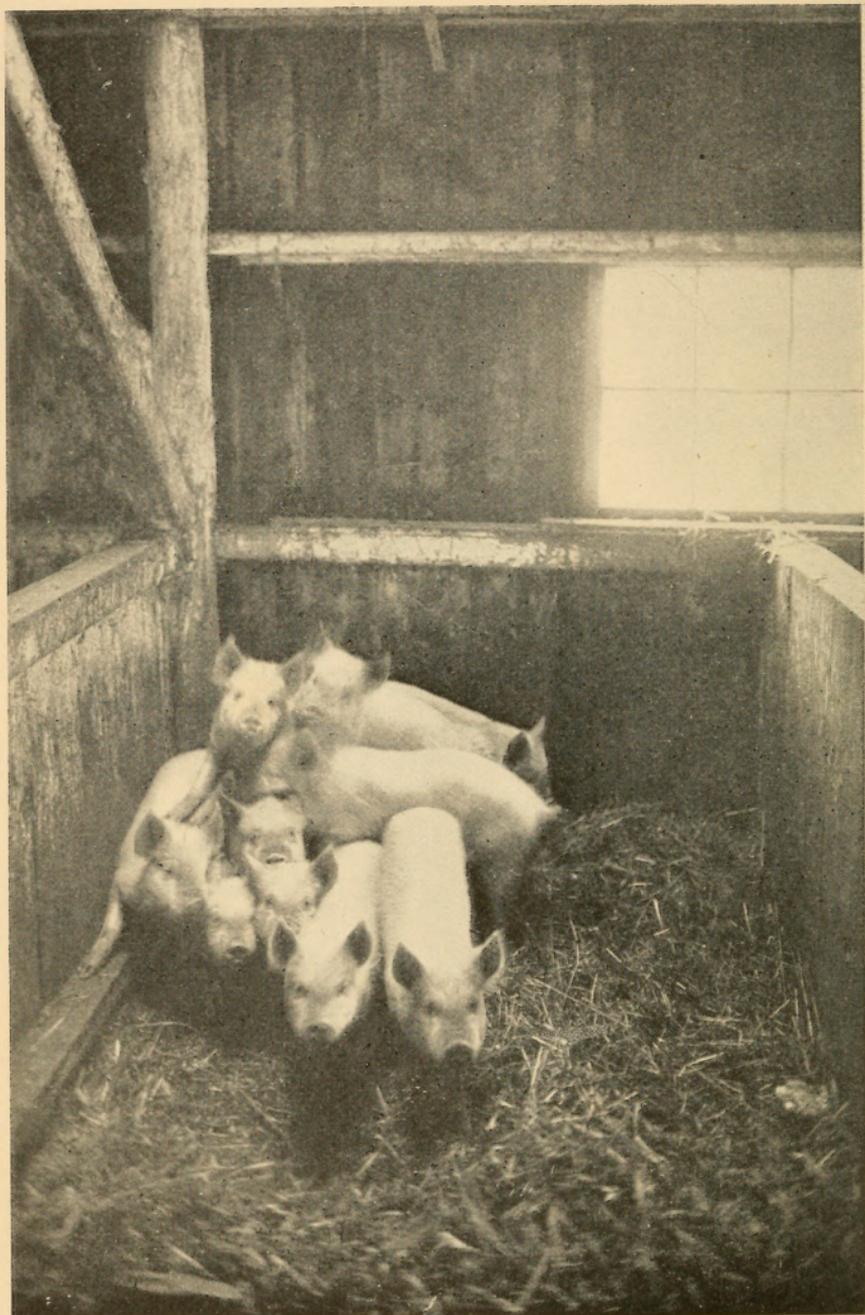
SUCCESS IN MARKET GARDENING

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AN IMPORTANT ADJUNCT TO THE MARKET GARDEN

Success in Market Gardening

A NEW
VEGETABLE GROWERS' MANUAL

By
HERBERT RAWSON

REVISED AND ENLARGED EDITION



ILLUSTRATED

NEW YORK
DOUBLEDAY, PAGE & COMPANY
1910

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PREFACE

The present volume is a revision of the book of the same title written by my father, the late W. W. Rawson, which ran through several editions.

In 1907, a year before his death, my father fully appreciated the fact that any further edition of his work would have to be thoroughly revised in many important details, especially with regard to varieties of vegetables at present under cultivation. With this in mind, he had actually started rewriting the book, doing it in a leisurely way as opportunity offered. It is a keen regret to me that he did not live to complete his labours; death overtook him before he had done much beyond making a number of miscellaneous notes and amendments.

I have, therefore, undertaken this task of revision in a sense of filial duty and regard, allowing as much as possible of my father's own manuscript to appear in the present edition, which is offered to present the most up-to-date methods of com-

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SUCCESS IN MARKET GARDENING

CHAPTER I

INTRODUCTORY REMARKS — LOCATION AND SOILS
— LAND DRAINAGE — IRRIGATION OF CROPS —
ESTIMATES OF COST — INSTRUCTIONS

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

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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 toward 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

INTRODUCTORY REMARKS

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 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 over-

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looked, 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.

LOCATION AND SOILS

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.

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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

LOCATION AND SOILS

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 endeavour 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

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unfavourable 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,

LAND DRAINAGE

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, favouring 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 favour 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 Professor Mapes's 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 endeavour 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

LAND DRAINAGE

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 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 the 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 dis-

IRRIGATION OF CROPS

tribution 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 barrellful 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

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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 a 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 favourable, 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

IRRIGATION OF CROPS

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 crosswise), 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.

One excellent method of applying moisture to the soil consists in sending water through lines of tiles properly laid in the ground, with joints slightly open between each tile and the next one — a method mostly practised on low lands. The distribution of the moisture is accomplished very successfully, by stopping the lowest end of each line of tiles and filling into it from the highest point. This method I would recommend for low and heavy lands; because if water were to be applied to the surface, the soil would harden and an injury to the growing crop would result. On sandy lands the largest benefit will be derived by running it over the surface about once a week; applying about one inch at a time, which is above the average quantity resulting from a good rainfall in our New England climate.

When the rainfalls are of average amount and come with uniformity, no addition by way of

irrigation is required; but when, as is very often the case, no rain falls for two or three weeks or more, it may become necessary to make two or three applications. Irrigation by watering the foliage is not recommended, except under glass, where it is often necessary, and can be applied without injury to the growing crop.

It is better to water under glass on a pleasant day than on a stormy or cloudy one; but in the field a cloudy one would be preferred, if the water was to be applied so as to wet the foliage.

There are numerous market gardeners at the present time who have abundant facilities for supplying themselves with water for irrigation; though it has only been secured, ordinarily, by a liberal outlay.

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 be located near a pond, lake, or stream,

IRRIGATION OF CROPS

or resort must be had to undercurrents of water that may be reached by a driven well.

I much prefer to pump from wells in all cases, because in the summer the water from ponds or rivers is quite warm, while that from wells is cool, and this coolness will be an advantage to the crop, especially if the ground is very dry and hot, as is often the case; and again in winter, if taken from ponds or rivers, is very cold, and could not be put upon the plants until it had been warmed, while that taken from wells would be at a proper temperature to be applied immediately. For these reasons I have always preferred the wells; and have always used them.

Pumps used for irrigating are of three kinds, depending on their motive power, namely, windmills, steam pumps and gasoline pumps. For those who can afford the outlay it is much the better plan to have a windmill with either of the others.

The windmill will do the cheapest pumping but when it does not pump a sufficient quantity then the other motive power can be used.

My experience with steam power has been much more extensive than with gasoline engines, and for that reason in the following pages I will

discuss principally pumping by steam. However, gasoline pumps are being used more extensively every year, and it may be an open question whether they can do the work at less expense. In many places there are elevated ponds or rivers that can be caused to flow by gravity to the point desired, either through closed conduits or pipes, or in open canals; when such is the case, no pumping is necessary.

After a sufficient supply of water is found, and a method of raising it to a proper height for distribution, by the use either of steam pumps or windmills, or both — a tank or reservoir of the largest attainable capacity must next be provided for the purpose of storing the water so raised until it can properly be distributed 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

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depend upon one's situation; as above said, it will pay to have both.

The expense of fitting up such an arrangement for irrigating a market garden is not so large that gardeners should say they cannot afford it. At present prices and in the light of our present experience, we can reckon the cost at figures much lower than five years ago. If one has not the means to pay for these facilities, and does not feel warranted in going into debt for what one wants, of course one must do without them, and depend on transient watering 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 favourable 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 labour.

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Unfortunately we do not know from one day to another what weather to expect, whether a deluge or a drought. We are in constant fear lest the shower that comes to-day may be the last for a month; yet we have to put the water on lightly for fear there may be a deluge the next day. One inch of water at any one time is all that is safe to apply. If there is no rain for a week, then another inch; and so on through the season, as the necessity appears. I think that one inch of water over the surface once a week will keep any crop growing in the driest weather.

A good steam pump will supply that amount over one acre of land through a three-inch pipe in six hours. 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,

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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 frequently 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 often 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. It is often found practicable 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

* Consult Chapter Seven.

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can be irrigated by the use of a steam pump in a day of twelve hours is about three acres. By using a suitable pump we can throw one hundred gallons per minute, which, in a day of twelve hours, would be equivalent to covering three acres more than seven-eighths of an inch deep; equivalent in quantity to what we should call an abundant fall of rain; — indeed, it is rather more than an average of rainfalls, and certainly we cannot believe there is ever an acre of growing crop which, in a dry time, would not be benefited by such a watering to an amount much more than the cost; though many people shrink from the expense involved, and are skeptical about getting full return for the outlay.

But certainly where water can be had in ample quantity, and can be applied at such moderate cost as may be inferred from the foregoing statements, it must be plain to every one, and, practically, every one does now believe that it will and does pay, in frequent instances earning many times over the amount it costs. It has oftentimes occurred that such watering, once or oftener applied, has saved a crop that, without it, would have been a complete failure. For

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my part, I would as soon think of being without a steam pump as the farmer who cuts hay would of being without a mowing-machine.

— 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.

Be sure to provide a good pump, one that will pump at least seventy, and better if one hundred, gallons per minute. I do not recommend the smaller pump, for it will cost just as much to run one of the small size, except for a trifling difference in the quantity of coal required; and the price of a large pump is not much more than that of a small one, while it will do many times the work with the same labour.

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It takes one man to run the pump and one to attend to the hose. Only a very little hose will be required, if the land is well piped in the manner following: I would advise beginning the piping with two-and-one-half-inch cement-lined pipe placed under ground with hydrants set but a short distance apart. Run one such line from the tank-supply main fed by the mill or pump, as the case may be, to each of the buildings and hot-beds; and pipe for all the outside culture with three-inch pipe of the same class carried above ground, and furnished with faucets suitable for attaching hose at intervals, so arranged that the distance in any direction from each faucet to the next shall not exceed seventy-five or eighty feet. This surface-pipe must be taken up each year in the fall and replaced every spring.

Such arrangements may appear rather expensive, but it will save much time in the busy season to have the water carried to all parts of the place. On a place of ten acres, the cost of putting in pump, boiler, pipes, and fittings need not be over \$1,000. I would rather have a place of ten acres well fitted up for irrigation, than one of twenty without irrigation; and I venture the assertion

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that I could raise more vegetables, or receive more money for my crops, in a period of ten years, from the ten acres irrigated, than from the twenty acres not irrigated.

Any farm that has been well equipped for irrigation, whether it be one or five, ten or twenty acres, will bring enough more at any time, when offered for sale, to pay for the amount so expended. Therefore, the expense, beyond fuel, labour and repairs, would be only the annual interest on the cost. We will allow \$50.00 for interest, or \$5.00 per acre on ten acres. The direct cost of running pump for twenty-four hours continuously, would consist of the following items: Coal, \$3.00; skilled labour, including repairs, \$7.00; additional help in moving hose, \$2.00; making a total of \$12.00, to which add, for wear and tear, \$2.00; then we have \$14.00 as the cost, exclusive of interest, for each watering of six acres; or \$2.33 per acre.

But the total interest charge remaining unchanged, whatever the number of waterings made in a season, has to be borne in equal shares by all the waterings. The resulting cost for a single watering might be as high as \$7.33 per

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acre, if it were the only one made that season; but if two applications are made, the cost drops to \$4.83 per acre. In the case of three, the resulting cost for each one will amount only to \$4.00 per acre; and, where there are four, only \$3.58.

In the foregoing calculation we have reckoned on the pump as discharging one hundred gallons a minute. The seventy-gallon pump would, substantially, do the watering of only four acres, instead of six, within the time computed for, with but an imperceptible amount of saving on the total cost of the day's operations.

The practice of irrigating by the aid of pipes and hydrants has only lately been introduced here, and owing to the great outlay involved, the method is used by comparatively few. But too much cannot be said in favour of irrigation; and the use of windmills and steam pumps has become well-nigh universal.*

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

*Consult Chapter Seven.

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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. Very many similar instances might be given.

In applying the water to a field of cabbages or cauliflowers, 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 fre-

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quently 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 driest time.

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 unfavourable 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,

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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

PREPARATION OF THE SOIL — LAYING OUT OF LAND FOR THE DIFFERENT CROPS — ROTATION OF CROPS — MANURES — THEIR APPLICATION

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,

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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 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 on 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,

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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 "subsoil," 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

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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 landside 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 landside 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

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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, 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

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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 larvæ of the May beetle, the pestilent white grub, and other larvæ 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.

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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 favourable 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 downward 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

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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.

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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 one is cultivating, and knows what crops have been grown on each portion of it the previous season, of course one can make one's plans accordingly. But if it be the first season of one's occupation the arrangements must of necessity be guided by such information as one 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 one.

It is a good idea, when practicable, to have a plan of the garden on paper, and to have this

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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

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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.

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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 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 maggoty, and otherwise diseased, than

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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 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

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on which all are agreed: 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 labour.

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

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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

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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 unneces-

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sarily 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 underestimated, 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

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it should not only be insisted upon, but looked after, and its faithful performance insured. Solid manure should never be allowed to ferment, either outdoors 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 composts 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 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.

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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, bonedust 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

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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 vigour, 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

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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, a business which has grown extensively in volume the past few years.

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,

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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

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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 use of the 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 upward and backward, 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 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

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rely on them alone and 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 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 everything 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

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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 produce 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

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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

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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 favourable in a cool season than 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 plats — 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 once been published 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

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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 is the subject 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

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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's "Talks on Manures," published a number of 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

APPLICATION OF MANURES

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

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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 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 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

APPLICATION OF MANURES

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 now felt necessary, in view of the continually recurring droughts, to provide effectual means of irrigation.

Sometimes, however, a crop comes to a standstill 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 inexperienced person just how to detect the wants of the crops, but a little acquaintance with their normal habits of growth will speedily teach one what one 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

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place it directly on the hill and about the plant; and the labour 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 — GARDENING IN HOT-HOUSES — GATHERING CROPS—CAPITAL AND LABOUR 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 it is to be had as a gift.

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Always look for quality first; and when satisfied in this respect, pay the price if it is in any wise reasonable; for you must remember that these extra strains have cost an amount of labour 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.

VITALITY OF SEEDS

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 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

VITALITY OF SEEDS

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.

LENGTH OF TIME FOR WHICH DIFFERENT SEEDS RETAIN THEIR VITALITY

Artichoke . . . 5 years. Asparagus . . . 4 " Beans 5 " Beets 5 " Broccoli 5 " Brussels Sprouts 7 " Cabbage 7 " Carrot 5 " Cauliflower . . . 7 " Celery 8 " Corn 2 " Cucumber . . . 12 " Dandelion 3 " Egg-plant 7 " Endive 9 " Kale 5 "		Kohl-rabi. 7 years. Leek 2 " Lettuce 5 " Melon 7 " Onion 2 " Okra 3 " Peas 4 " Parsnip 1 " Pumpkin 7 " Parsley 3 " Radish 3 " Salsify 2 " Spinach 3 " Squash 7 " Tomato 5 " Turnip 5 "
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The general rule above suggested, giving preference to last year's seed, has some exceptions.

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Plants such as melons, cucumbers and squashes (though they grow 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 vigour 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,

SEED GROWING

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 more equable than ours — a condition which is more favourable 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 a supply from dealers for one-half what it costs to produce it one's self, the quality of one's 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 neighbours; and my trade in seeds, commencing in this way, constantly increased from the beginning, until I was 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



TESTING SEEDS FOR VITALITY



SEEDLINGS OF CUCUMBER PRICKED OUT FROM THE SEED BED. IN A WEEK'S TIME THESE WILL BE READY TO POT



DIGGING OVER HOT-BED AFTER HEAT IS PUT IN, PREPARATORY TO SETTING OUT CARROTS AND RADISHES



PULLING RADISHES FOR MARKET

SOWING THE SEED

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 freshly 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.

SOWING THE SEED

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 radish; 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 necessary 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

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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

CULTIVATION OF CROPS

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 upward, 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,

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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 larvæ, reinforces the plant, and enables it to withstand parasitic 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

SUPPLYING THE HEAT

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 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

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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. Steam has been applied to hot-beds, but with no good results as yet.

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 with 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

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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.

SUPPLYING THE HEAT

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

In the spring of the year, it is quite a serious task for a man to take charge of, say, 1,000 sashes, with 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 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 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,

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ordinarily, be expected to be about as follows: say for the first crop, \$2.50; for the second, \$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.

GARDENING IN HOT-HOUSES

Sixty years ago very little growing was done under glass; and if any one had as many as one hundred sash he was considered quite an extensive market gardener. But when early vegetables began to be grown in the South and sent into our

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market, some forty years ago, our gardeners began to increase their use of sash; and some thirty years ago hot-houses were put into service. These have gradually become more and more relied upon in the growing of plants and vegetables, until now a market gardener who has no hot-house is considered far behind the times. There are even now many thousands of sashes used every spring for covering hot-beds; but the houses are much easier of management, and with the use of either steam heat or hot-water pipes nearly all the kinds of vegetables that can be forced are grown in houses.

There are many advantages secured by this method of culture. We can employ our men the whole season and are thereby enabled to procure better help; and we have something to carry to market the whole season through. Besides, the houses are a great help in running the sash, as the plants can all be started in the houses and transplanted, no matter what the weather may happen to be.

One must have considerable intelligence and skill to run a number of houses together with several thousand sash; and a market gardener of to-day must understand many different matters.

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He must be an engineer, a machinist, a carpenter, a chemist, a botanist and a horticulturist. It will cost him time and study to make himself familiar with all he has to look after. It will take him all of five years' time, and he must show himself an able scholar, even then.

In hot-houses, the temperature required being attained by the use of pipes conveying steam or hot water, relatively a small amount of manure will be requisite as compared with that required to create and maintain heat in beds, by the process of fermentation.

It requires a fifty-horse-power boiler to heat one hundred thousand cubic feet of space to a temperature of 60 degrees when the outside air is at zero Fahrenheit. It takes one ton of coal for every five hundred cubic feet of space to heat at same temperature and carry through the season from November 1st to the 1st of May, and there must be provided one foot in length of one-and-a-quarter-inch steam pipe for every twenty cubic feet of space to heat the pipes to be equally distributed. With the use of hot water instead of steam, it takes a four-inch pipe to do the same amount of heating that is done by the one-and-a-

GATHERING THE CROPS

quarter-inch steam pipe; and if the weather comes off warm in the morning the pipes of hot water will remain hot; while steam heat can be immediately shut off and can be let on again at any moment. With water it takes from one to two hours to get the pipes warm again after being cooled off.*

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

*Consult Chapter Seven.

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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 unsaleable by careless handling and packing for transportation.

The same considerations, though perhaps less obviously, 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.

AMOUNTS OF CAPITAL AND LABOUR REQUIRED

Among gardeners, opinions vary as to the area that an individual may wisely include in his plans.

CAPITAL AND LABOUR REQUIRED

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 a larger variation still will result from the greater or less provision we may choose to make in the matter of hot-houses. Not including these in the scheme of cultivation, and on the presumption that we are to do such forcing only as can be done in hot-beds, we may fix approximate amounts as follows:

While it might require about \$3,000 with the labour of three men and two horses, to properly handle two acres, we 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. But in a scheme combining, not only hot-bed and out-door

cultivation, but forcing-houses as well, the possible outlay is, of course, almost unlimited.

A very important item of annual outlay is the supply of stable manure. This will cost, at present prices, delivered on the place, from \$4 to \$7 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 for highly cultivated land, while other land in the remoter suburbs, and not in as good condition, might be had for \$10 per year — exclusive of buildings.

There may doubtless be found some tracts of land under cultivation where ordinary interest, reckoned on the purchase money invested, would amount to \$200 or more, annually, per acre; but these are, of course, exceptional cases.

With regard to the expense of labour, it may be stated that average men receive about \$45 per month, or about \$1.75 per day, during the summer season, and about \$43 per month, or \$1.65 per day, during the four months of winter. Of course, skilled labourers might expect to receive

CAPITAL AND LABOUR REQUIRED

more, but to obtain it they must be men of some experience and natural adaptation 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 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 a large number of them.

By looking over the foregoing it will be seen that, if we exclude the more elaborate culture in hot-houses, 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 and improve the culture by use of the best methods and appliances.

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

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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 much alike, are the varieties we have had in mind in writing the above.

THE JERUSALEM ARTICHOKE (*Helianthus tuberosus*), differs from the foregoing in the fact that it is cultivated for its tubers, which are pickled like cucumbers or eaten raw sliced as a salad, or boiled like potatoes. 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

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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 a good 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, others 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,

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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 the 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, if stable manure is to be applied, these seed stalks may be mown down and the ground cleared off by burning over; but in case commercial fertilizers are to be employed, it will be of advantage to let the stalks stand, for protection, mowing them down in the spring.

The varieties are numerous, and differ considerably. Moore's Giant and Giant Argenteuil are the two varieties now most in use.

As already said, the profit to be made from asparagus will not warrant its open-air culture upon the high-priced lands that lie near the markets where it must be sold; but, fortunately, it keeps well, and will bear transporting over long distances.

It has been somewhat out of favour with market gardeners, but it is now beginning to be forced in hot-houses, thus commanding a fancy price. Where it is grown in this way, the roots are dug in the fall and put into a cool cellar till required to be placed in the forcing-house. The asparagus will be fit for cutting in three or four weeks. The roots thus taken up are of no use after being forced in this manner.

BEANS (*Phaseolus vulgaris*). Dwarf or Bush kinds. This familiar crop flourishes best in a

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rather light, gravelly soil; and it should never be planted in very heavy land. Beans are extremely sensitive to frost and cold. 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. Whenever the land has become light and warm, select a dry and sheltered location; and on the ground lightly manured, and in good condition of tilth, plant in drills or rows. Hoe often, but only when dry. Plant at intervals till last of July for a succession.

In manuring for this 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 fertilizer, say wood ashes, or Bowker's Special 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 toward 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.

There is a large number of varieties of green and wax beans and many of these are identical, that is, they have been renamed by the grower or

seedsman and differ very slightly from the original variety.

I shall devote my time to only those varieties which are now grown in this vicinity, and which the market demands.

Of the green and pod varieties there are three classes, namely, string or snap beans, shell beans, and bush Limas.

Of the former the most popular are the Bountiful, Early Red Valentine, Refugee, Longfellow, Burpee Stringless Green Pod. The Bountiful is an extra early variety, very prolific and with large flat pods practically stringless. This variety has taken the place of the Long Yellow Six Weeks which used to be grown universally.

The Early Red Valentine is as early as any of the standard sorts. Bears round pods of medium size and quite tender.

The Refugee, or 1,000 to 1, and Extra Early Refugee are both excellent snap beans with rather small round pods borne in great abundance.

Locally these two varieties are grown more for late planting than for early. The seeds are planted in July or early August, and are ready for market in September when they often bring

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a very good price. These varieties are also largely grown in the South for Northern markets in the early spring.

The Longfellow is a variety of rather recent introduction with which a number of growers have had good success.

Valued for its productiveness and for the length of pod, Burpee's Stringless Green Pod is perhaps the most tender of all the green varieties. Very productive with large thick pods. It, however, like all tender beans, is very susceptible to rust during the wet season.

Of the shell beans there are three that are in favour with the growers to-day, namely, Dwarf Horticultural, Low's Champion, and Goddard.

The Dwarf Horticultural is probably the most widely known. The pods when mature are yellowish and thickly splashed with bright crimson and quite plump.

Low's Champion is the dwarf red cranberry bean, with large pods borne well off the ground, and can be used either as a shell or snap bean. It is very productive. Of the bush Lima beans, there are three varieties that are in demand with the market gardeners. These are Dreer's Bush

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Lima, Burpee's Bush Lima, and Henderson's Bush Lima. Dreer's Bush Lima is the best, as it is early and more productive. The pods are thick and succulent and contain from three to five beans of fair size, more rounded than flat.

Burpee's Bush Lima bears a large amount of pods containing beans very flat and large, similar to the large white pole variety.

Henderson's Bush Lima is the dwarf Sieva or small Lima. It matures earlier than either of the above two, but, being smaller-podded, will not yield as many bushels as the Dreer's Bush Lima. The above three varieties are much more tender than the sorts that precede them and should not be planted before the latter part of May or rather till the ground is thoroughly warm.

Of the wax varieties, the Wardwell Kidney Wax, Rawson's Horticultural Wax, Davis Kidney Wax are the most widely grown in this section, though not a few stick to the older varieties as Golden Wax, Golden-Eyed Wax, Improved Golden Wax, and Black Wax.

Wardwell Kidney Wax is remarkable for its productiveness. Pods are long, flat and handsome in colour. It is quite susceptible to rust, however,

during a wet season. On account of this fact many prefer the Horticultural Wax which is practically free from rust. This latter variety is much better for a market variety than for one's own garden, as the beans have to be picked at a certain time, before they get too stringy. Davis Kidney Wax, while a fine yielder under favourable conditions, is very susceptible to rust. The pods when right, though, are handsome and sell readily in the market.

Of the older varieties the old Golden Wax is probably the most tender of all, but not so profitable from a grocer's standpoint.

Golden-Eyed Wax and Improved Golden Wax are much hardier than the old Golden Wax, but not so prolific as the first three varieties mentioned, and, therefore, of less value to the market gardener.

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.

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

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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 where 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 advanced stage of growth and earlier maturity; but this method 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 the height of four or five feet.

Dreer's Improved Pole Lima is the best of the pole Limas for the market gardener. Pods broad and of good size; very productive. Also earlier

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than the Large White Lima or King of the Garden Lima. Sieva or Small Lima is very productive and will continue to produce crop throughout the season.

Of the pole beans, the variety most generally planted for the market is the Worcester Pole. The best strains of this variety bear enormously large, long pods in clusters, brilliantly coloured crimson. Wonderfully productive, very tender, and, for a shell bean, surpasses any other variety. Mammoth Carmine Podded is somewhat similar and possibly originated from a stock of Worcester Pole.

Arlington Red Cranberry bean can be used as a snap or shell, and is very productive.

The old Pole Horticultural is not grown very extensively now, but years ago was the peer of any. It is from this variety that the Worcester, Brockton and other "Speckled Cranberry" sorts have come.

Kentucky Wonder is a variety enjoying popular favour, and deservedly so, not only on account of its productiveness, but also for its quality, being perfectly stringless, and very tender.

Of the wax podded pole varieties the Indian Chief

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and Pole Mont d'Or are worthy of mention. Both are black-seeded, very productive and stringless.

THE BEET (*Beta vulgaris*) is one of the most important crops and is of comparatively easy culture. Where possible, a rather light, sandy loam should be selected for this crop, in preference to a heavy soil. In order to have a succession of this crop throughout the year seed may be sown in the greenhouse or bed the latter part of February or early in March, and pricked out in the field in beds from the 15th to the 20th of April. They are pricked to a distance of from 6 to 7 inches apart in the rows, and rows one foot apart. These pricked beets should be ready for market generally the latter part of May, and invariably bring a good price, large enough to warrant the extra trouble.

For the first crop of sowed beets, seed should be sown about the middle of April or as soon as the ground is in a suitable condition to work.

The land should be made up in the form of beds about 6 feet wide, the rows be planted by machine at a distance of from 12 to 14 inches apart, and the drills should be at least one inch deep. It is well to sow the first crop rather thick,

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as it may save reseeding, which is sometimes necessary on account of severe weather when the young plants are coming up.

After the plants have gained a good foothold they should be thinned out to a distance of from 6 to 8 inches apart. Clean culture should, of course, be given, and the soil well enriched.

The above remarks apply to the crop when grown for early marketing. For fall or winter use seed should be sown from the last of June to the middle of July according to the variety used.

Of the varieties now in use by successful market gardeners there are only a few of superior merit. These are Crosby's Egyptian, Arlington Favourite, Detroit Dark Red and Edmand's.

Crosby's Egyptian is probably more generally used in New England than any other. As an early beet it has no superior, as it reaches the desired size quicker than any other sort. The beets are of good size, not too large, rather flat than round, and possessing that deep blood flesh that is so much desired.

This variety is also used as a fall beet, planted early in July, and thinned out to from 4 to 6 inches apart. Can be kept till late into the winter.

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Arlington Favourite is largely used for a second early or main crop. Beets are very shapely in form with smooth skin, and fine marketable size. Flesh is deep blood red, of excellent flavour, very sweet and tender.

Detroit Dark Red is a nearly globular beet with a smooth dark skin and dark flesh. An excellent sort for late planting, maturing early and keeping crisp and tender. Edmand's is another strain which is used for late planting, and in many localities cannot be surpassed. The beets run very even in size and grow a very short top, which at once recommend it to the market gardener. Flesh is also deep blood red. Considered to be one of the best-keeping beets grown.

There are many other sorts grown, such as Boston Market, Eclipse, Dewing's, etc., but the four varieties mentioned above are the cream of all the known sorts for market gardening.

BET GREENS are also grown extensively as a crop in the greenhouses, and often bring \$1.00 to \$1.50 per bushel.

SWISS CHARD is a sort cultivated largely for its broad leaf-stalks. The stem and midrib of the leaf may be boiled and served similarly to aspar-

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agus, while the strippings can be used as spinach. When cut it should be cut close to the ground, allowing new growth to spring up.

In marketing beets, the pricked crop and early-sown crop are nearly always bunched.

They are pulled when they reach the circumference of a silver dollar and tied in bunches of four. Eighteen to twenty-five bunches are put in a bushel box, but twenty is the best number, as they are sold by the bunch. These bunches bring from 5 cents to $2\frac{1}{2}$ cents per bunch according to the earliness or lateness of the season.

At this price a fair crop would yield \$400 to \$500 per acre.

Late beets are always sold by the bushel, and a fair yield per acre would be 300 bushels, which should bring upward of \$150.

The Crosby Egyptian Beet is often used as a second crop following cabbage, peas, beans or spinach, or some other early crop that will be out of the way by the middle of July.

For this late sowing, six pounds of seed to the acre is sufficient, but for the early spring crop at least eight pounds should be used.

BORECOLE, or KALE (*Brassica oleracea acephala*)



CROSBY EGYPTIAN BEET



RAWSON'S PERFECTION CABBAGE



EARLY JERSEY WAKEFIELD CABBAGE

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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, 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

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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 flavour.

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

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inches between the plants. This will insure strong, stocky plants, and will also induce the formation of an extra quantity of roots.

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

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like the greenish purple colour 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 California.

BRUSSELS SPROUTS (*Brassica oleracea bullata*). 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

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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.

Dwarf Improved is very tender and is distinguished for fine flavour; 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 devot-

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ing 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 the land 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 \$7 per cord, delivered on the place.

The applying would cost about \$6; ploughing, \$2; marking, or furrowing, \$2; setting, or transplanting, \$5; hoeing, \$5 (which would include cultivating); plants (6,000 at \$5 per thousand), \$30; rent, \$25; marketing, \$25; making a total of \$240.

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 thus appears that they cannot be grown at smaller actual cost than four cents per head. The general average price is only six cents, which would indicate a profit

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of only \$120 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 cabbages, 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 cabbages; 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 cabbages is quite large, there is a large number that we can discard as useless for the market gardener.

For an early variety you will have to grow that sort which your market demands. For instance, the Boston market will not take so well to the

pointed or sugar-loaf varieties as some of the cities south of Boston.

Of the pointed heads the following have been proved to be superior: Rawson's Volunteer, Early Etampes, Jersey Wakefield, and Charleston Wakefield.

Rawson's Volunteer and Early Etampes are similar in type, the former having the advantage of a few days in earliness. The heads are not quite so large as in some of the other varieties, on account of the earliness in maturing.

Early Jersey Wakefield is the variety most extensively grown and is superior to any other as regards firmness, sureness of heading and fine keeping qualities.

Charleston Wakefield is similar to Jersey Wakefield, but much larger in size.

Of the early round flat-headed sorts, Early Spring is by far the best. Will mature close upon Jersey Wakefield, and is remarkable for the uniformity of heads, which at once recommends it to the market gardener.

Early Summer matures about ten days later than Early Spring. Heads are very solid and of excellent size. As it is larger than the preceding

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sorts, it should be planted a little farther apart, say about twenty inches in the row, and the rows three and a half feet apart.

Of the main crop or second early varieties, All Season, Fottler's Brunswick, Succession and Rawson's Perfection are worthy of mention.

All these have larger heads than the extra early sorts and are very compact and solid.

For late or winter varieties, Stone Mason, Drumhead, and Danish Ball Head are the best sorts for the market gardener. The heads of the Stone Mason are very large, round, wonderfully solid and of a crispness and tenderness that are remarkable.

Danish Ball Head or Emperor is famous for its hard-heading qualities. The remarkably solid heads are round in form, and keep in excellent condition when buried during the winter, often coming out in the spring perfectly solid.

The wider planting is better, even in places where cabbages are sold entirely by weight. We do not doubt that by setting 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 fewer 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 Curled Savoy comes along the latest: and is grown mostly for winter use. The Globe Curled is the popular Curled Savoy cabbage of the Boston market. The Drumhead Savoy, which is a cross of the Globe Curled and Drumhead, is a large-headed Savoy cabbage, tender and fine flavoured, a good winter variety. It differs from the Curled in being of larger size and less curled. As a Savoy it is less desirable than the smaller variety for eating, but the crop is a profitable one to raise. It is a good variety for winter use.

The Savoy cabbages have wrinkled leaves and have a peculiar flavour that is much liked by most people. They are improved in quality by a slight touch of frost. The Globe curled variety, before named, is an American sort. English Curled Savoy is a peculiar sort used for early spring greens.

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

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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 land best suited to this crop is a deep, rich, loamy soil, and should be prepared by very heavy manuring; lap two furrows together about three and one half feet apart and beat them down nearly level with a fork. A sprinkling of wood ashes on the young plants will keep off the cabbage-fly, and promote their growth.

For late crops, sow from June 1 to June 20, and even as late as the 1st of July, in the field, or in beds, so as to transplant. Cover three-quarters of an inch deep, as the soil is drier now than earlier

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in the season. Shade and water the late sowings in dry weather to get them up.

It is important that the plants should stand thinly in the seed-bed, or they will run up weak and slender, and be likely to make long stumps. When the weather is hot and dry the roots of the plants may be dipped in a puddle of loam and water, and transplanted just at evening, giving each plant a gill of water at the root. If planting seeds in hills twenty-two inches apart, plant six or eight seeds; of such as come up, reserve one and transplant the rest.

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

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in a row as close as they can stand; then turn up the earth with the plough 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 all are set out. Another way is to place the cabbages head downward 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. In some of the houses where cabbages are stored, they are placed head down on the shelf, laid as close as possible, and only one deep. The temperature is kept at about the freezing point.

CARROT (*Daucus carota*) has become during the past ten or fifteen years one of the principal market gardening crops. This has doubtless been brought about by the increase of foreign population.

Carrots require a very finely pulverized and por-

ous, 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 grown under glass they are usually sown with radishes from the 10th of January to the 1st of February. Two rows of radishes are sown in the hot-bed and then one row of carrots. From the middle to the last of March the radishes are ready for pulling, which leaves the carrots in full possession of the bed.

It is best to grow in the above manner some variety that has a short top and will mature early. Thus the two best varieties are, probably, Nantes and Chantenay.

The sash, being usually removed some time between March 20 and April 1, 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.

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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 usually bring, on an average, \$1 per dozen bunches, five carrots being put in a bunch, and at this price the crop will bring about \$1.50 per sash.

For the out-door crop there is only one variety that appeals to the market gardener, especially in New England, and that is the Danvers Half Long.

Seed is sown in the middle of April, the first sowings preferably in beds about five feet wide in order to get the carrots out in time to follow with celery. Sow five rows to each bed. The outside rows on each bed should be pulled first as soon as large enough for bunching in order to have room to set celery plants during July. From the latter part of July the carrots are sold in boxes.

The latter sowings for late summer and fall or winter use are sowed in drills about one foot apart.

CAULIFLOWER (*Brassica oleracea botrytis*). The culture of this crop involves much painstaking labour. When grown in large quantities they

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are usually stored in the fall for winter marketing. They are one of the various forms of the cabbage family and require similar general treatment.

In the ordinary cabbage, which is a biennial plant, the rounded, thick, fleshy, strongly veined leaves afford the edible portion; being collected into a head the first year, at the summit of a short and stout stem. In cauliflower, and similarly in Broccoli, the nutritive matter mainly concentrates in short, imperfect flower-branches collected into a flattish head.

It is naturally a fall crop, and will not well bear early forcing, although the heads are now grown to some extent in hot-houses, out of season, thus commanding high prices. They are more or less subject to club-root; as to the cause and remedy for which there is not yet much satisfactory information; and there are other limitations to their profitable culture which gardeners have not yet perfectly learned.

In out-door culture, when they do well they will usually pay better than early cabbage; but there is much more risk in cultivating them. As raised in this locality, about six thousand are grown per acre, and if maturing well will bring in

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about \$700. The price varies from \$1 to \$2 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. From the first of May until the first of July, according to the date when plants will be wanted for setting, is the time to put in the seed. It is a crop that well repays generous treatment in cultivation. With a deep rich soil, well supplied with moisture, which in dry seasons must be artificially furnished, cauliflowers can be grown well. Frequent hoeing and a liberal supply of rich liquid manure, to keep up a continuous and rapid growth, will produce splendid heads of the most delicate flavour. It facilitates blanching if the leaves are gathered loosely together, and tied over the top of the head to protect from the sun. They must be taken before the flowers begin to open.

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.

Sowing for plants of the very earliest varieties may be done in houses or hot-beds in February.

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or March; or later in a cold frame. Sow as late as June 20 or July 1, for late crops, in beds or in hills, covering one half-inch deep. For the early fall crop, sow in May and transplant in June, in rows four feet apart, setting the plants two feet apart in the row; water frequently if the ground be dry.

As directed for cabbage culture — give the young plants special attention, if the weather be hot and dry at the time of transplanting, and use means already described to prevent injury resulting from their roots becoming in the least dry from exposure to sun or air. Transplant at evening as far as practicable; and always choose a moist day rather than a dry one, if circumstances permit a choice.

The young plants are frequently attacked by a little black beetle, but its ravages may be stopped by frequent applications of plaster dusted on in the morning while the dew is on.

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 colour of the heads. It is quite distinct and the surest header we know of. The Snowball, being a very

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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 for both 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 a large size. The Algiers is a splendid sort, the largest and latest of all the varieties grown. It is the kind most in use for pickling, because of its superior size and weight.

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. The sowing should be done early in the spring in light, rich soil; transplant in May into beds and water freely in dry weather. The earthing up is done when the plants are nearly full-grown, and the bulbs

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should be covered to a depth of four or five inches. In about a month they will have become sufficiently blanched. The globe-shaped bulbous roots form the edible portion, and are commonly ready for use in October. For winter use they may be stored in trenches after the manner in which celery is kept; or placed in sand in a cool cellar.

They are used on the table in various ways; they may be put into soups; or sliced and used with vinegar, making a most excellent salad; or cooked by boiling, after being scraped and sliced, till they have become very tender, after which they are stewed in just milk enough to cover, then seasoned with salt and served with butter. A very productive variety is known as "Apple-Shaped"; very regular, almost spherical in form, with a fine neck and small leaves; it may be planted very thickly and will yield a heavy crop. It is botanically classed as a kind of celery, and is often catalogued by seedsmen as a variety of that plant.

CELERY (*Apium graveolens*). Although the culture of this crop has become widely extended, and the amount of annual product has vastly increased of late years and is still continually

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increasing, it is none the less a fact that the profitable management of it is a matter of exceeding difficulty. The crop is one that demands more careful and laborious attention than almost any other in the market-gardener's list.

The seed is extremely small and remarkably slow in germinating, and this presents at the outset one of the difficulties of celery growing, viz., securing a good stand of plants to commence with. To accomplish this demands, amongst other things, a seed-bed well and thoroughly prepared, a careful choice of the most suitable varieties and a skilful sowing of well-selected seed.

In choosing a place for starting the plants, find 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, using 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

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watering, until the plants are well up, which will usually be at the end of three or four weeks' time. 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. The seed does not suffer from age until it is over five years old.

In describing the foregoing method we have assumed that the plants are to be lifted and transplanted, but many growers sow the seed in the rows where the crop is to stand. On many accounts we prefer the former plan. You will always get a much more even and generally a more vigorous stand by transplanting, than when the plants have grown from seed sown in the field and have been cultivated by thinning out; and the former plan has been found in our experience to succeed the best all the way through. Still, since the results of the same experiments will often vary in different localities and under differing conditions, it may be well for any one to try both methods, and to follow up the trial far enough to perceive which it is that seems the one best adapted to his own situation. Much may be found to depend upon the natural quality of the soil — its



SEA FOAM CAULIFLOWER, A FAVOURITE FORCING KIND



PARIS GOLDEN SELF-BLANCHING CELERY

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condition of tilth and general preparation — the risks resulting from the vicissitudes of the weather, etc. Yet the fact remains that it is usually much better and easier to transplant a crop from the seed-bed than to thin out a standing one, and the plants so established will exhibit a more uniform growth.

When the celery is to follow cabbage or other early crops, the plants are usually twice transplanted — once from the seed-bed, and again when set out permanently in the open field. When lifted from the seed-bed, they are put out five or six inches apart, so that, when next to be removed they can be lifted singly, and without their being so violently disturbed as when lifted from a bed where they have grown too large standing close, and with the roots all twined together.

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; the crop needs and must have plenty of moisture during droughts, or a shortage will be the inevitable result.

When celery is to follow early cabbage, it is the usual custom to plough the land before setting the plants. But no manure should be applied

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beyond that already in the soil. Experience proves that the land is usually able to carry out the crop better by relying upon the unconsumed portion of the fertilizers supplied to the earlier crop than by addition of fresh manure.

Care must be taken to set the plants at just the right depth — just so deep as not to cover the crown — and the loosened soil must be pressed down and brought together firmly about the roots. Celery of all kinds should be planted for level culture, and not in trenches.

We have usually had the rows four to five feet apart, and plants six inches apart in the row. The only cultivation necessary after the setting, until it is time for the hilling-up — usually termed banking — consists in keeping the ground free from weeds and the surface mellow. Never hoe or bank when wet.

Where the celery is set out for a late crop, and is to be banked but once, the plants may in that case be set in rows only four and a half feet apart. The first transplanting is to be done in June, the second in July; sometimes, in a very wet season, it may be successful if as late as the first week in August.

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If the crop has been planted out early, banking may begin 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 later, according to the season; and if the celery is not very large, one banking will be sufficient, as it only requires to be straightened up to have it keep long; and it is better if blanched but very little.

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, twenty-four feet apart and about two feet high from the ground. The boards for covering should be thirteen feet long, the ends

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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 boards covering the pits 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

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they can be kept closed, and the celery allowed to ripen.

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.

In taking up loam for covering the roots of one row, another trench is obtained for setting down the next. A space of about six inches is usually left between each row and the next, to afford an air circulation; but, if the lot is not required to remain on hand long, this space is not necessary, and the rows may be brought close together. As much dirt as possible may be left on the roots and it will keep all the better. The roots only should be covered with the loam, and no part of the stalk. It should not be put into the pit in a wet condition if it is intended to have it remain there for any long time.

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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 two to ten cents per root.

The varieties now most in favour are Paris Golden, White Plume, Giant Pascal, and Boston Market. The first-named is grown for earliest. The plants may stand quite close in the row — at six or eight inches apart, and with rows only 20 inches apart. When set in this manner, every other row is blanched by setting up boards, running lengthwise, on each side of the row. The same method may be followed with the intervening rows, or they can be banked with earth after the first have been blanched and gone to market. Celery blanched with boards is more easily cleaned for the table or market, but the process is less efficient as a means of inducing crisp and tender growths. Paris Golden is also known as Golden Self-Blanching, and the designation is true, to a certain extent, owing to its close habit

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and compact, erect manner of growth. This shapely style of growth, and also the clear golden-yellow colour of the hearts, and of the leaves, after the blanching process has been applied, contribute to make it a very attractive kind. It is a sort very easily grown; it shows well when put up for market; keeps well in the boxes, and looks well on the table; but it is not first-class in quality. However, for early use, large quantities are disposed of, and the thing that will sell is the thing to grow. It is usually sold from the field, being a sort that does not keep well in pits; and lasts till after Thanksgiving.

White Plume, already spoken of, is attractive-looking in growth, and also when prepared for market is very handsome; and is of excellent quality. This sort is blanched by banking with earth until ready for market; like Paris Golden, it is best sold directly from the field. The inner stalks and leaves of this variety are naturally white.

Giant Pascal is the variety most largely grown for late celery or, as it is called in Boston markets, Green Celery. Unsurpassed for keeping and will yield more bunches to the acre than any other of the late sorts.

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Boston Market is the oldest of all, and when properly grown is still best of all. It is very liable to blight unless grown on moist land; it will keep longest of any, but all depends on it being grown well.

For profit, the Paris Golden and Pascal will do best. The Pascal can be grown six inches apart in the row, three to four feet between rows and Boston Market the same, by the latest practice.

The market now demands a bunch of solid hearts; this is made by putting two or three together. Preparing the celery for market is laborious and expensive — the most expensive stage through which it passes. Every separate root has to be dug, trimmed, knifed, washed, and packed. Some times two or even three roots are required to make a bunch equivalent to one good-sized root. It is usually packed in boxes, twelve to eighteen in each. It cannot be grown (counting every root) for less than two cents per root, and leave any profit to the grower. It is sold by market gardeners at wholesale, by the box of one or one and a half dozen, the price ranging from 75 cents per dozen to \$3.00 for the late winter market.

CHICORY (*Cichorium Intybus*) is generally

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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 Schænoprasum*) 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

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the growing season. Sometimes they are used in soups, for flavouring; 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 colour was quite ornamental.

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 labour-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 subsoil, well enriched and thoroughly worked.

There is no crop which will respond more quickly to careful and liberal treatment, as is proved by the fact that, within the last few years,

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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 neighbours 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 favourite 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

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(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 toward the hills so that water will not stand about the stalks.

If the season should prove favourable, 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 come 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 over three and a half or four feet high. The Early Crosby (an older variety) is a favourite with many growers and private gardeners as a medium early sort.

Early Red Cory and White Cob Cory are popular among some growers. They are fine yielders but not of extra good quality.

Quincy Market is another sort and of better quality than the Corys, though not so early. Concord Bearsfoot is becoming one of the standard sorts. A great yielder and of the finest quality.

Potter's Excelsior or Squantum is an old variety and still largely grown.

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. Marblehead Mammoth is a first-rate large-eared variety, twelve- to eighteen-rowed, of vigorous growth and excellent quality; cob white, large and well filled; very productive and fine-flavoured, the largest and latest of all. Stowell's Evergreen is yet another late standard sort, twelve- to sixteen-rowed, very sweet and of good quality; keeps in a green state longer than any other kind.

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CORN SALAD (*Valerianella olitoria*), or Feticus, 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 favourable, it should be ready for use in about two months from the date of sowing. When 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.

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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.

UPLAND CRESS (*Barbarea vulgaris*) is classed as a separate vegetable, being different from the common curled Cress both as regards parentage and habit of growth — though similarly used as a small salad. It is a hardy perennial, thriving on any soil, wet or dry. It makes an early appearance in spring, and grows with such extraordinary rapidity that in a few days it may be gathered for use, weeks ahead of any other out-door growths. It is as easy of culture as spinach, can be grown easily for two years without resowing, and yields enormous crops. The seed should be sown in April.

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 in 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 of doors, and when forced under glass is much more so.

For growing in beds, 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 degrees, 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 degrees at night, or higher than 90 degrees during the day. In case the thermometer rises higher than this, the beds should be cooled by raising

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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 bearing until about July 15th or between six or seven weeks.

Of late years the growing of this crop under sash has not had the success of former years. The plants have been affected with blight and insects that were not prevalent years ago. By the

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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 in August. Vines of this sowing will come into bearing about October; and at that season of the year cucumbers will usually bring from five to ten cents each. The vines are left to bear as long as they continue doing well. Then the ground is cleared off, and another crop is put in, say of lettuce. 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.

To get the best returns from cucumbers in the houses the crops should be planted so as to be bearing from March to June. To do this the first crop should be set about the middle of January and this crop will pick about the first of March. Seed for this crop is sown about the 10th of December and after plants are pricked out from the seed-bed and allowed to remain there for a

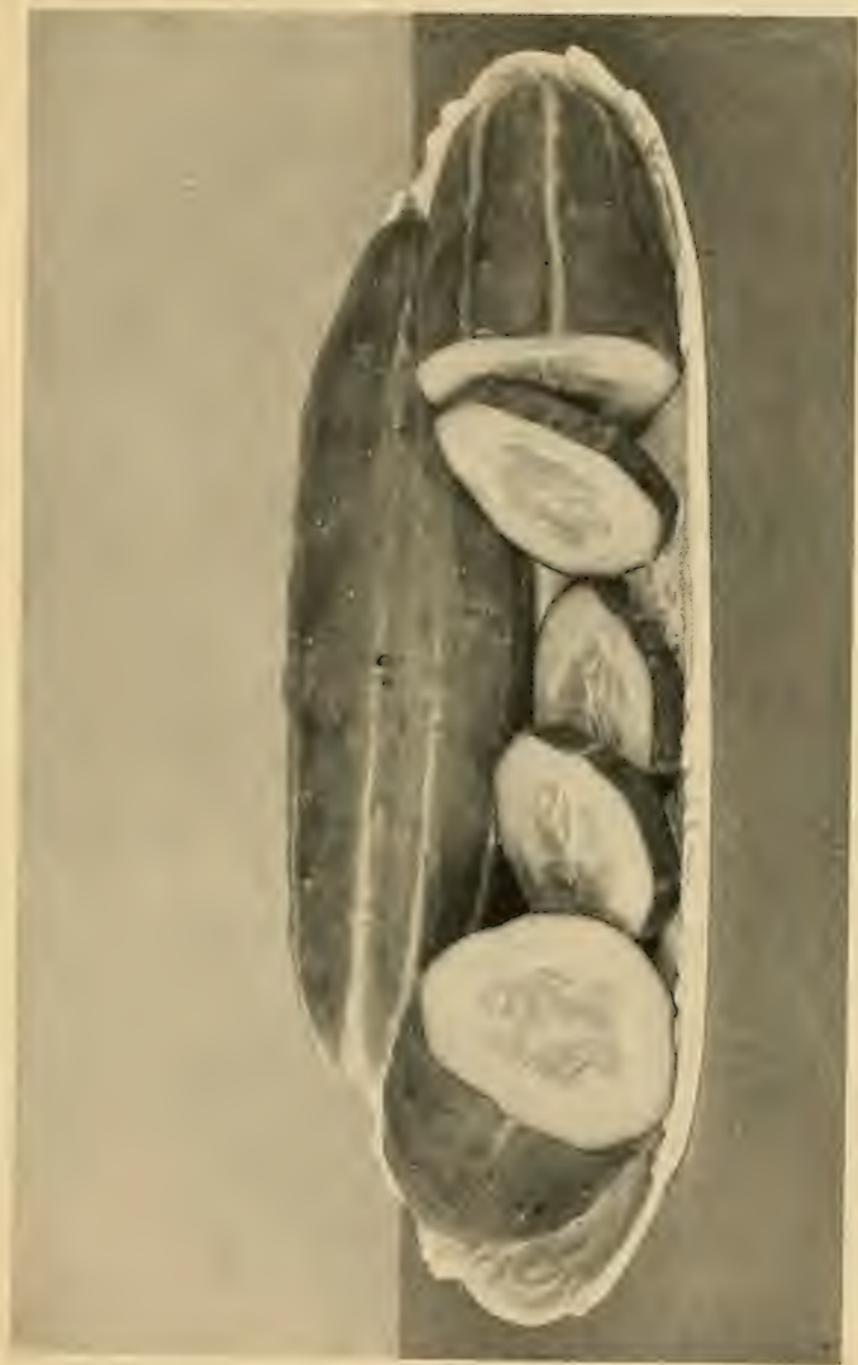
SUCCESS IN MARKET GARDENING

week or ten days they are set into six-inch pots, two plants to a pot. These pots will form a ball of dirt by the time the house is ready.

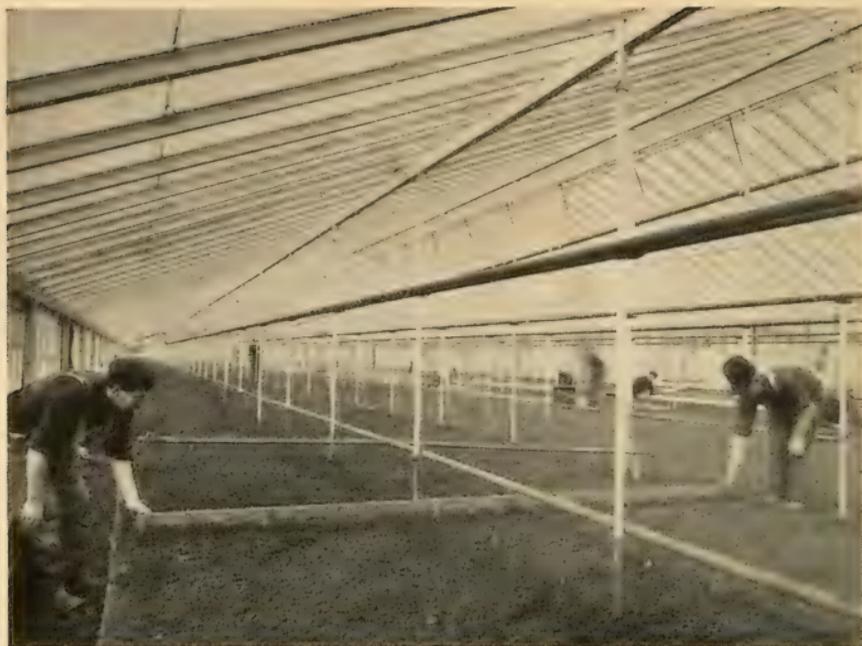
Successive sowing of the seed should be made every week for houses to follow the first house after crops of lettuce have been pulled.

Cucumbers in March will bring from 12 to 15 cents each wholesale, 6 to 10 cents during April and 4 to 6 cents during May.

For the first early out-door crop the plants should 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.



RAWSON'S HOT-HOUSE CUCUMBER



MARKING FOR LETTUCE PLANTS TO BE SET IN HOUSE AT
A DISTANCE OF EIGHT INCHES APART



LETTUCE PLANTS READY TO SET INTO THE HOUSE

VEGETABLES RAISED FOR MARKET

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 apiece; 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.

Rawson's Hot House is the best variety for forcing and is also fine for out-door culture. The cucumbers are quite long, of deep green colour and excellent shape. It is a variety of White Spine that has been brought to its present state of perfection by the most careful selection. The Early Cluster is a very popular early variety, which produces cucumbers in clusters. The Green Prolific, a pickling variety, favoured 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 a well-known late variety, 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 (*Taraxacum officinale*) is almost exclusively 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-coloured as to be almost invisible. A little lettuce seed, say an 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 to \$2 is about the range of price. On the out-door crop \$1 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 ten cents 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

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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 colour, 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 a popular salad. In New York and Philadelphia there is a considerable demand for it.

Endive requires a good supply of moisture, and should be sown where it will be least exposed to heat 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's or six weeks' time

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(varying according to the season) the plants will be ready for use.

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

The Broad-Leaved Batavian is used to some extent, principally for soups, but is not nearly so 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 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 (*Ocimum Basilicum*), is a native of India. The leaves are used for seasoning, and, to a limited extent, for medicinal purposes. Sow in hot-bed or green house, if practicable, in March or April, and transplant to open ground after the weather is settled. A sandy soil is almost essential.

CARAWAY (*Carum Carui*), a native of Europe, produces the "caraway seed" which is so universally used for flavouring. 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

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

ROSEMARY (*Rosmarinus 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.

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.

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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 flavouring, and especially when cooked with beans impart a very pleasant flavour. 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.

TANSY (*Tanacetum vulgare*) is cultivated in gardens and also found as a roadside weed; growing from two to four feet in height, with smooth, strong-scented foliage of acrid taste. *T. balsamita* is smaller, sweet-scented, with pale yellow flowers.

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 five to six

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cents per pound; each barrellful 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 for 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 the 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 flavour 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 cocanut. It is then tender and of fine flavour, but later on becomes tough, stringy and unpalatable. Early Purple Vienna closely resembles the preceding, except that the colour 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 flavour of an onion, and is used principally for flavouring 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 a 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 tenth of August, these are afterward transplanted into the houses. The

resulting crop is ready for marketing about the last of October. Sowings are made about one week 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. A good method 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, although somewhat costly at times. 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 should not be given them, it is quite likely they might be destroyed. 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.

* Consult Chapter Seven.

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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, fifty 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 in the houses and grown there until the last transplanting.

The heat for hot-beds, as has before been said, is mostly horse manure fresh from the stable; and it takes one cord of this for every eight sash for the early winter beds; but for those started after the fifteenth of February one cord will answer for twelve sash. The expense of this, all put into the bed and ready for use, is nearly one dollar per sash, reckoning the putting down of bed, putting on sash, mats, and shutters, and bed set out to lettuce; so that the cost of raising lettuce in the winter with four dozen under each sash is

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twenty-five cents per dozen to start with; add cost of plants, twelve cents more; making the cost of raising lettuce in the winter season fifty cents per dozen, without reckoning in the carrying to market.

The second crop can be grown much cheaper than the first, say at forty cents per dozen; because the bed is all ready. It will require only two-thirds as much manure; and not over two-thirds as much time will be consumed in taking care of the second crop as of the first. Then, too, the spent manure that is taken out in renewing the beds is worth something, perhaps all of half-price, or we may say twenty-five cents per sash for use elsewhere. But, allowing for all this, I believe there is no profit from growing lettuce in hot-beds at fifty cents per dozen. In houses it can be grown for less than in beds, and its cultivation in houses is thought to pay fairly well.

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

In this vicinity Rawson's Hot-House and Hit-

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tenger's Belmont have been almost exclusively the varieties raised for forcing; but the Black-seeded Tennisball is preferred for out-door culture.

Rawson's New Hot-house is nearly double the size of the old White-seeded Tennisball, and exhibits qualities of most superior excellence. This kind is altogether the best yet introduced for growing in greenhouses and hot-beds; being the largest lettuce grown, and being also a sure header, and not liable to rot in the heart. These important traits make it an extremely desirable sort, and profitable in cultivation.

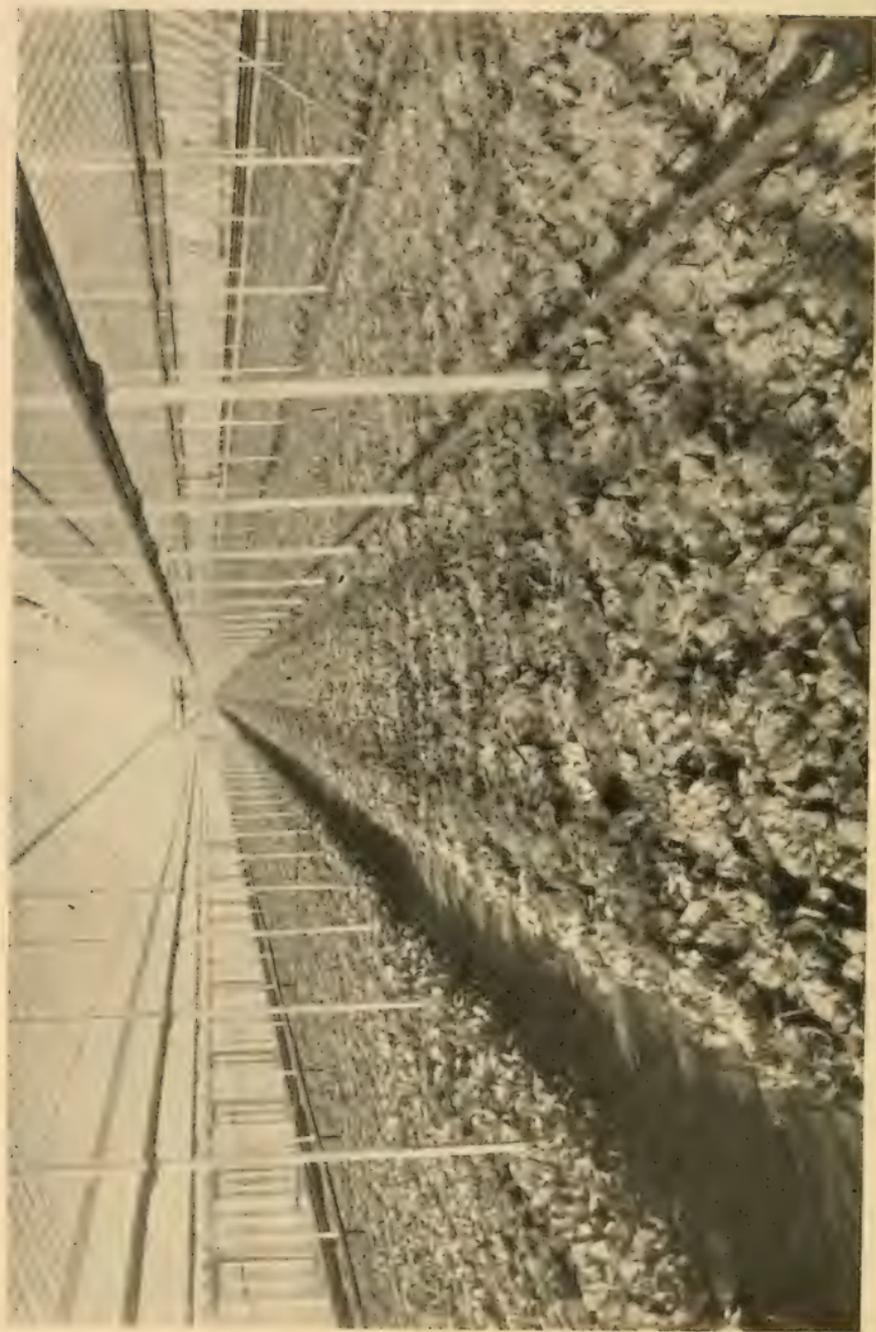
As we have remarked, the first sowing of seed for plants to be forced is made about the tenth of August. Black-seeded Tennisball is first sown in February, in the houses; and then transplanted to hot-beds. After being hardened off, it is set in the open ground about the last of April or the first of May, and will be fit for cutting about the first of June. The price for this lettuce is about the same as that grown in the houses. This is set, in the field, about one foot apart; or it may be set among cabbages; or in the onion field, where space has been left for a later growth of celery. As soon as the ground can be worked



PUTTING IN BOTTOM HEAT FOR A SECOND CROP OF LETTUCE



TAKING UP PRICKERS OF LETTUCE FROM SEED BEDS;
PLANTS THREE WEEKS OLD FROM SOWING



A HOUSE OF LETTUCE ONE WEEK PREVIOUS TO MARKETING

VEGETABLES RAISED FOR MARKET

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.

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

Early Curled Simpson is another excellent curled variety, pale green in colour. It does not form very compact heads. Hanson is one of the leading "head" lettuces for house, garden and other out-door culture.

The name "Cos" applied to lettuce denotes a class of plants distinguished by the formation of tall, upright-growing leaves without disposition to head—a defect remedied by the art of the grower, who gathers these leaves together and binds them into a compact bunch or head; when they blanch and grow tender, thus becoming fit

in their appearance and condition for market and for the table.

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

MARTYNIA (*Martynia proboscidea*). 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 afterward transplanted — or may be sown in April in the open ground, and transplanted later. They should be spaced three feet apart each way, as the plants are very spreading in habit.

On good soil the pods are produced in 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 very difficult to grow. The best plan is as follows: Take fresh horse manure and shake out all the straw and coarse part, using

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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, allowing the prepared material to stand as it is. 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 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 favours, 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

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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 allowance for insects. The planting may be done about May 15th.

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.

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They are rather an uncertain crop, and are cultivated but very little by market gardeners in this section.

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 is started on sods 9 inches by 9 inches, 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 Hackensack, which is one of the most popular sorts for the main crop. The latter is of good size and of excellent quality.

The Surprise is a variety of considerable merit for the home garden, but it is not large enough for market.

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 invariably 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 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 especially 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; but the demand is small.

White Mustard is the variety best liked as a salad; and the seed, which is of a very bright yellow colour, 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 colour and the leaves are a trifle more pungent. It is used both as a salad and for manufacturing into table mustard.

OKRA (*Hibiscus esculentus*) is grown for its seed pods, which, when young and tender, are used in soups and stews; but sales in the Boston market are very light. 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 except under favourable 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 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 flavour which, to most people, is very 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

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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 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 the 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 barrelled 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 75 cents 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



DANVERS YELLOW GLOBE ONION, NEW ENGLAND GROWN STRAIN



DIGGING PARSNIPS FROM PIT TO SEND TO WASH-SHED
FOR MARKET



PARSNIPS IN TUBS READY TO WASH

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.

Of late years many market gardeners have also grown onions from pricklers, the Prizetaker and Danvers varieties being sowed, preferably the former, on account of large size. Seed is sown in beds about the 20th of February, fairly thick, and are set out into the field about the middle of April or the first of May. The yield per acre is much greater than with the sets, but they do not mature so early.

Until modern inventions of the labour-saving sort came forward, very largely superseding the old methods of hand-cultivation, the sowing and growing of this valuable and remunerative crop were an extremely tedious and laborious business. Now, after the preparation of the beds has been properly accomplished, a smart boy of sixteen will seed more ground in a day, and do it better, than twenty men could at the time when seed drills were unknown; and the labour of the after-culture during the growth of the plants has been almost equally lightened by modern devices.

The ground must be such as has been well enriched with long and liberal manuring; and recent addition of green manures must not be relied upon for affording the close-growing plants their proper nutrition. The tilth should be as perfect as it can be made, and the plants must have the cleanest possible culture.

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 favour, the Red Wethersfield is highly esteemed. It is a very productive, large sort.

PARSLEY (*Carum Petroselinum*) is kept at all seasons in continuous growth, either under glass or in the open ground. Seed is sown out-of-doors as soon as the ground can be worked, in drills about one foot apart. The plants for forcing are kept cut down during the summer, and in the fall are placed under glass, 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

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Curled, though similar, is a little more crimped. Plain Parsley is the smooth-leaved sort, used mainly for flavouring. 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.

PARSNIPS (*Pastinaca sativa*) require careful attention to secure proper germination. Thorough preparation of soil and early sowing will promote that result. Sow in rows twelve inches apart.

It is well to sow some of the seed in beds about five feet wide, as these parsnips will be ready for bunching in August and will bring a fair price.

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.

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Of the varieties the Hollow Crown is by far the best. Not only is it easier to grow but it has a much readier sale in the market.

Arlington Long Smooth is still grown extensively, but it requires a deep loam, and is very hard to dig.

Guernsey is another sort, but is not so popular as Hollow Crown.

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 foot 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 reserved about five feet wide, for planting squashes before the peas are ready to be removed.

The pea comes earliest to maturity in light, rich soil; but for the general crop, a deep loam, or a soil strongly inclining to clay, is the best. Plant as early as the weather will permit, in well-prepared ground; cover one inch deep and the seeds will come earlier than if deeper. Later sowings may be covered from two to six inches

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deep; the deep planting tends to prevent mildew, and to prolong the season.

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 balance will remain for the later crop. When it is intended to cultivate in this manner, the early varieties are always sown, as the late ones would not get off soon enough. For the early crops mild manure such as leaf mould will do well, but leaves not much for the following crop; and if the soil is very poor, a stronger manure will be needed to grow the peas.

Fresh manures and wet, mucky soils are to be avoided, as they cause the vines to grow rank and tall: the plants make a great growth in vines, but fail to develop and mature the pods.

Sowing should be begun as soon as the ground is fit to work, and continued at intervals of a week or ten days until the first of May. For a continuous supply during the season, make plantings until the last of June; then sowings should be discontinued until the middle of August, when an extra early sort will sometimes produce a good crop.

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All the wrinkled sorts are superior to smooth sorts in every respect except earliness; they are more delicate in flavour, richer in saccharine matter, and remain longer in season. The market gardener, however, is not disposed to keep the vines long in bearing, as he usually wants the land cleared for other use. The earliest and the quickest-growing sorts are the best in that case.

Amongst all the numerous varieties offered, the very earliest is undoubtedly Rawson's Clipper. When first brought forward, in the spring of 1886, it had proved on our trial grounds to be the earliest in cultivation. It has now been in the hands of one of our most experienced growers for over twenty years, and after careful tests has proved earlier by several days than any other.

It is very uniform in growth and distinct in habit, about thirty inches in height, profusely covered with well-filled pods. It is one of the sweetest and best-flavoured of the smooth varieties. The entire crop can be gathered in two pickings; it is a very productive and valuable market variety.

Among the early wrinkled varieties Gradus, Thomas Laxton and Sutton's Excelsior have

taken the place of the old American Wonder and Nott's Excelsior.

Gradus and Thomas Laxton are varieties similar in habit, with enormous pods, fairly well filled and of tenderest flavour. They are great yielders and invaluable for the market gardener.

Sutton's Excelsior is an English variety of superior merit. Very early, bearing large-sized pods abundantly on rather dwarf vines.

For a medium early crop a good strain of the old McLean's Advancer is desirable.

Of the late sorts, Stratagem and Telephone have the call. Many of the market gardeners grow an early wrinkled sort, as Excelsior, in succession rather than the taller-vined sorts, as Stratagem and Telephone, on account of saving of labour in bushing and freedom from mildew during the dull days of August, to which the tall sorts are subject.

All the late kinds need wider planting than the early dwarf sorts — about four feet between rows is not too much. The number of bushels of pods raised from a bushel of seed peas varies from one hundred to one hundred and fifty; the price (though depressed and irregular as a consequence of

shipments from the South disturbing the market, especially as regards the early crop) will average about one dollar per bushel.

PEPPERS (*Capsicum annuum*) 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. They are a family of plants exhibiting very remarkable diversities in shape, size and colour, as well as in the more or less pungent taste by which they are characterized; some changing, as they ripen, from the green colour of the young pod to various brilliant shades of red, and others to yellow and orange tints of like intensity — thus becoming in the highest degree ornamental and interesting, but of course not any more valuable to carry to market.

All Peppers require a warm, mellow soil, and heavy manuring applied either before or during growth. The rows may be set eighteen inches apart, and the plants a foot apart in the rows.

Of certain sorts, the pickle factories use large quantities, which are grown at very small prices on contracts; but our market gardeners raise peppers only in very small lots; merely enough to

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supply the retail trade. The Squash or tomato-shaped variety is the kind chiefly grown for the pickle factories, and is well adapted, being thick-fleshed, of pungent flavour, very productive and of good size.

The Bell, or Bull Nose, is a large and mild-flavoured 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, being similar in shape, not unlike in flavour, and larger; while in the same class with these old and well-known varieties comes the new Ruby King, of larger growth and milder flavour than either — in many respects a superior kind, and unequalled by any other. It commonly attains a size of from four and a half to six inches long by about four inches through. The fruit is so mild and pleasant to the taste that it may be sliced and eaten with pepper and vinegar as is done with tomatoes or cucumbers, and when thus used makes a very agreeable salad. The plant is of a sturdy, bushy habit of growth.

Long Cayenne is the strong pungent variety with which every one is acquainted. It is very late, and the pods while still young and green are

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frequently used for pickling. Another very hot and pungent variety, of similar quality but not quite so acrid, and of entirely different habit of growth, is the Red Cluster; in which the small, thin peppers, of a coral-red colour, stand crowded together in bunches at the top of each branch. It closely resembles the Chili, from which variety it originated.

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 favourable, 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"; 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

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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. For this purpose, put the rows three feet apart. Drop the seed ten or twelve inches apart in the row; cut to one eye, around which leave a good portion of the substance of the tuber, so that the young growths may have plenty of nourishment until the roots get well established.

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 death to the bugs.

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 well-shaped, medium-sized ones, cut to a single eye.

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 eyes (as is more especially necessary to those who buy new and valuable varieties), the following method is adopted:

An indentation will be found in each tuber, clearly indicating which is the stem end. The cuts, to be made with a thin-bladed knife, are all sloped toward it; each cut removes one eye, proceeding, in succession, from the lowest to the highest. Humphrey's potato knife is one specially devised, with a blade of curved and concave shape, for cutting out single eyes in general accordance with the above method, and possesses some advantages over an ordinary knife, for that service.

Cultivation of the young plants should commence as soon as they are fairly above the surface of the ground, and continue until the appearance of the blossoms, when no further attention will be required until the time of harvesting the crop.

At each successive hoeing, bring up earth against the plants, adding a little each time both for

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support to the stalks and also to develop the side-shoots.

For digging the crop, there is at present no more satisfactory implement provided than the digging-fork or the potato-hook. There are, to be sure, already several different implements designed and constructed, and to some extent, perhaps, put to use for employing the labour of horses in loosening and lifting the tubers from the soil. But the best of them — the very latest as well as the earlier ones — have attained but a very moderate degree of success, even when working under fairly favourable conditions; and in stony or mucky soils will not do the work. There is still a fortune in waiting for 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. Standard favourites are the early and late varieties of Beauty of Hebron, Green Mountain, Irish Cobbler, Early Norwood, Bovee and Uncle Sam.

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Whatever variety is most popular should be chosen to plant for market; and where there is close similarity it is evident that soil and cultivation are of far more importance than choice of a kind.

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

For growing in hot-houses the Scarlet Globe 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 degrees to 60 degrees. 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

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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, they are 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. 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 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 will require thin-

ning, say to three inches apart. When pulled, they are put eight in a bunch.

Besides the varieties we have mentioned, the following are grown to some extent in home gardens and for special consumption: French Breakfast and Early Scarlet Olive-Shaped (both good forcing varieties, good also for out-door culture) and White Tip Scarlet Turnip.

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. It is generally propagated from plants obtained by dividing the heavy, fleshy root, which grows to a considerable size in plants long established; and these are improved by the removal of a part — also by occasional transplantings to new grounds.

When raised from seed, the sowing is to be done in April, in drills about one inch in depth.

A deep, very rich retentive soil is desirable for growing such large and tender stalks as the market

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demands, and for bringing them forward in good season. A few days lost or saved in getting into market often makes a difference of one-half in the 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 bushel boxes and will return from \$2.00 per box at the start down to 35 cents during May.

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 first of February. The price on forced crop varies even more than that of out-door growth; but \$5.00 is a fair estimate of average returns from each 3 x 6 sash.

The two varieties best known here are the Linnaeus, early, large and tender; and the Victoria, also large, but later; of the two the former is the better kind, though both are good.

Another sort, very superior to either, and in fact better than any other variety known, is the Paragon, earliest of all, and very productive.

It is not inclined, as are some other sorts, to run to seed. The leaf is small, while the stalks are large and heavy.

SALSIFY (*Tragopodon porrifolius*). Culture of this vegetable, although limited, is increasing. It is also known under the name of Oyster Plant, or Vegetable Oyster. It should be sown early, in drills fifteen inches apart; the seeds to be covered an inch and a half deep. The crop will succeed best when grown on a light, sandy loam, well enriched and very 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. The Mammoth Sandwich Island is the best kind, very smooth and white, growing double the size of the Long White, and of excellent quality.

SEA KALE (*Crambe maritima*). This vegetable produces blanched shoots which are cooked and eaten in the same manner as asparagus. It is less extensively cultivated than it deserves to be.

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The seed is sown early in the spring, in drills fourteen inches apart, and covered one inch deep. After the young plants are up, thin to six inches. It is a perennial plant, and requires to be transplanted the following spring, into ground that has been thoroughly trenched and well manured, being then placed in hills three feet apart each way.

Late in the fall, when the leaves have separated from the crown, heap over each plant a shovelful of clean sand, and earth up a ridge a foot and a half high over the rows, from a trenching dug along the space between them, and beat it smooth with the back of the spade.

In the spring, after the cutting is over, the earth should be levelled back into the trenches, so as to expose the crowns of the plants; and a good coat of strong manure should be spread and dug around them. There is only one variety in cultivation.

SPINACH (*Spinacia 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

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covering of hay or boughs. This crop generally lasts until about June 1st, when that 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.

It is sown in drills, three feet apart, and thinned to about twelve inches apart in the row; though the New Zealand (a very large hot weather kind, not much cultivated) requires intervals of two feet or more.

The crop will bear a liberal amount of manure, and for the fall-sown crop a dressing of about seven hundred pounds of sulphate of ammonia is usually given in the spring.

For the spring sowing the Round Thick-leaved is used, and for later use the Long Standing; so called because it stands longer (by about three weeks) without going to seed than any other variety. In fall sowing for spring cutting the Arlington Pointed Leaf is the favourite, as it is choice and hardy. The Prickly, or Fall Spinach,

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is a prickly seeded sort, with triangular oblong, or arrow-shaped leaves, the hardiest of all; mostly used for fall sowings. The Savoy-Leaved is a curled sort of good quality, and very ornamental in appearance.

SQUASH (*Species of Cucurbita*) 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. They are exceedingly tender, and must not be planted in the spring till all danger from frost is over.

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 favours, 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 Prolific 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 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 saleable sort, on account of the colour; but its keeping qualities are very poor. The true Boston Marrow is light-coloured and quite round, and when planted late will keep almost as well as the Hubbard.

Next in order comes the Bay State; after it the Turban, which is followed by the Essex Hybrid. The two last-named are nearly alike in appearance, the only difference being that the Hybrid has a hard shell. The Hybrid is much the better keeper of the two — is more productive and is also of better quality.

The Bay State is superior to either, uniting in itself a long list of desirable qualities — such as

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extraordinary weight and solidity of flesh, fineness and dryness of grain and sweetness of flavour. It has also an extremely hard shell — always a sign of superior keeping qualities. The colour of the shell is green, but the flesh is of a bright golden yellow. It is equally productive with the Hybrid.

In form and general appearance, it bears some resemblance to the Essex Hybrid, but has a more deeply corrugated surface.

As these later 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 harvested and out of the way before the vines crowd upon them. These two varieties reach maturity about the last of August, and continue bearing through September and October, or until frost. The Turban must be marketed soon after picking; but the Hybrid and Bay State may be kept well into the winter.

Among the varieties maturing latest are the Hubbard and Victor Marblehead; of which the first is almost universally preferred.

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Squashes are sold by weight, with the 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.

When picking for storing great care should be taken not to bruise them or break off the stems. They are brought from the fields in wagons and put in piles, to remain until quite dry, and then stored in an even temperature as near 50 degrees as possible.

THE TOMATO (*Lycopersicum esculentum*) holds a high place amongst vegetables in general estimation, both for its use in a fresh state, and for canning and manufacturing into catsup; so that its extended and still increasing cultivation is a subject peculiarly interesting to market gardeners of the country. Within the past twenty years, the tomato, from an almost unknown and little-considered product of a few small gardens, has grown into popular favour to such an extent that the area of its cultivation is now reckoned in thousands of acres, and will doubtless continue to be further enlarged as population increases; especially about its chief centres and near the canning establishments.

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During this period of expanding cultivation there has been great improvement in varieties, not so much in respect of earliness, perhaps, as in size and quality.

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.

In very rich soil a tendency to grow too much to vines may be expected. The best results,

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both in quality and quantity, and of course the earliest-ripened fruit, will be secured from a warm, light soil, moderately fertilized with well-rotted manure in the hills, and in a sunny location.

Four feet apart in the row will do for the hills in the case of the early crops, to be raised on light, sandy soil. For culture on heavy, rich soil (only suited to the later crop) five feet apart will be needed.

The young plants should be given water freely at the time of transplanting; and may need some shelter from the sun for a few days, or until they become well established in their new location.

Some cultivators dip the roots and stems in a puddle or grout, when planting out, after the method we have advised for cabbage, and report that the addition of a small amount of kerosene oil stirred into the grout, operates as an efficient preventive of the cutworm. A mixture is made of equal parts of manure fresh from the cow stall and fine clay dust; this stirred up with water, and a handful of cotton meal to a bucketful of the mixture, makes an adherent puddle; into which is put a half-teacupful of the kerosene.

This difficulty with the cutworm is seldom exper-

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ienced by those who keep their ground under continual tilth throughout the whole season, as such culture serves materially to discourage and drive off these and similar pests.

As with squashes, and indeed with all other plants of a climbing or running habit, it is very conducive to stockiness and vigour of growth in the vines (and therefore to solidity and soundness of the fruit) to keep them well shortened back, by pinching off the extremities of the tops, and, more or less, of the secondary shoots which may show themselves above the earliest blossoms. This will develop a more stocky growth and will also hasten the maturity of the first fruits which set.

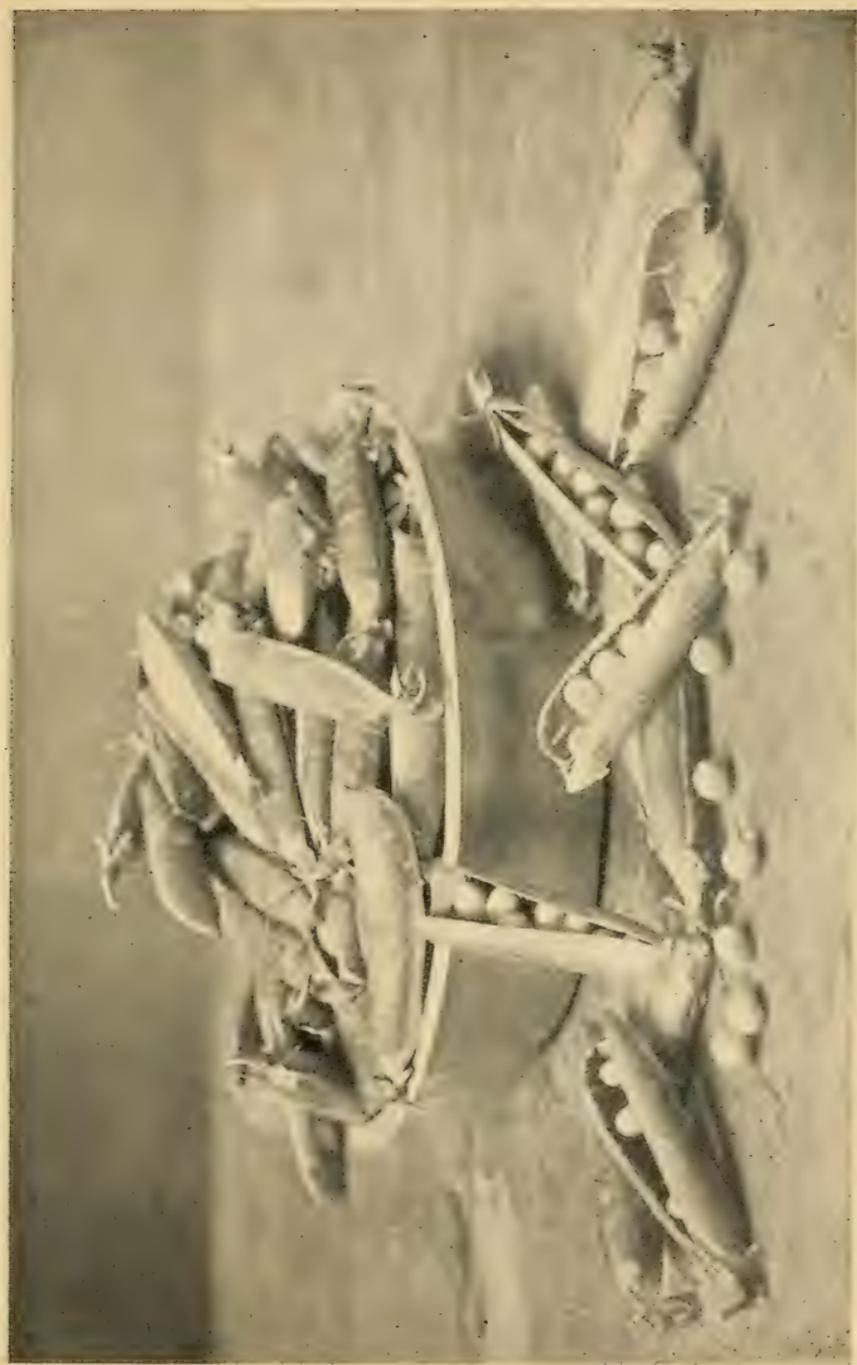
It is no longer considered good practice to allow the vines to trail upon the ground for lack of some support such as may be afforded by a trellis or in any similar way. This is often accomplished by what is called "hoop-training." Drive three stakes and fasten barrel-hoops to these. Another very good way is to use only two stakes and a single hoop; these stakes to stand three and a half feet high from the ground; and the hoop, which should be broad, flat and strong, to be well

nailed to the stakes at about three feet from the ground.

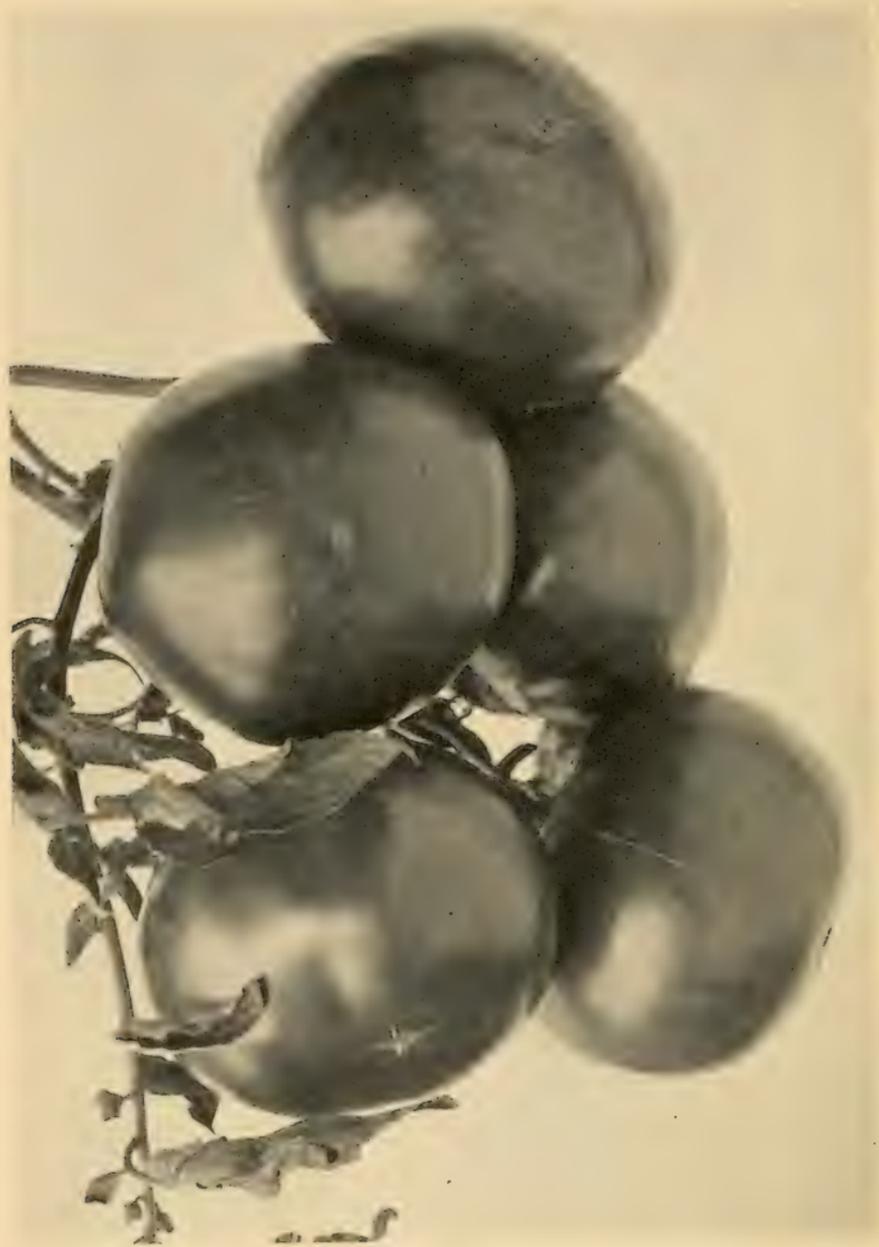
With the same object in view, a portable tomato-trellis is now made and sold, which serves well. Its construction is simple, cheap and durable. It is certainly a great convenience in tomato-growing. Either of the foregoing methods serves to prevent the tomatoes from lying on the ground; and thus develops and matures fruit that would otherwise go to decay, or at least fail to ripen off; and, furthermore, greatly facilitates cultivating and gathering the crop.

Near Boston the first picking is often made by the tenth 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 tomato is grown also in hot-houses, being started in the fall from seed; or may be grown from slips or cuttings. While the method of propagation by cuttings has been recommended and practised by some, especially for the later crop, I think it is far better to grow both late and early crops from the seed; as vines from cuttings are



RAWSON'S EXCELSIOR PEA



COMET TOMATO. A NEW VARIETY ESPECIALLY RECOMMENDED FOR FORCING

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found to be far less productive; and the plants from seed can be secured for any date in the season by timely sowing.

For spring crop in the house seed should be sown the latter part of December and pricked off about three inches apart. In about two weeks the young plants can be potted into 4-inch pots in order to facilitate handling later on. By the first of March they will be ready to set into the house. Plant 20 to 24 inches apart. As plants grow, trellis or string them to wires overhead to support the plants.

They should begin to bear in May and last till August. Care should be taken to keep the air in the house as dry as possible, to prevent mildew.

For the house-grown product the price is sometimes as high as fifty cents a pound; and they continue to yield good profits to the grower until shipments begin to arrive from the South. There are but a very few varieties suited for forcing, and among these the Lorillard is an established favourite. Comet and Wilson's Market Garden are new varieties especially recommended for forcing.

For out-door culture the varieties catalogued are

numerous enough, 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 proved not only to be one of the earliest but one of the most profitable in culture as a market variety.

Another early variety is Belmont, one which well maintains its claim to a front rank among tomatoes; being handsome in colour, ripening perfectly throughout and not inclined to crack or rot.

Earliana 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, nor as good in flavour, as those maturing later.

The best main-crop sort is the Stone. Large, firm, of bright scarlet colour, and a great yielder.

Only leading varieties have been mentioned.

TURNIP (*Brassica Rapa*). This crop is not very extensively grown in the market garden, as the demand is 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

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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 principal 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 Egg 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

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shipping well. 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. Phinney's Early is the best early sort.

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 a striped skin and thin rind. Kolb's Gem, or American Champion, a variety of established merit, is also highly esteemed as a market variety; it carries well, and is of extra fine quality. The Iron-clad is a favourite market variety in many localities. It grows very large and is a

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

YAM, CHINESE (*Dioscorea Batatas*). Although this vegetable has been grown in this country for several years, it has hardly obtained the popularity which it merits. It is really one of the most valuable esculents in cultivation. The vine will grow to a length of from ten to twenty feet, according to soil and location. The leaves are very dark in colour, and heart-shaped; the flowers are small, white and grow in clusters. The root is of pale russet colour, oblong, regularly rounded, club-shaped, largest at the lower end.

The roots, cut in pieces an inch long, or bulblets, should be planted eight inches apart. A deep, light 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 flavour.

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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 vigour 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.

I here bring to a close this discussion of special crops, and their appropriate special culture. In regard to the rules here given, and to the general rules for cultivation which occupy the earlier pages

as well — I take occasion to remark that a wide field yet remains open for experiment and enterprise. Every grower should be an experimenter (of course we mean on a prudent and moderate scale), and should habitually report his processes and results for comparison with those obtained by others. He should take pains to observe accurately, and report faithfully and in full detail all such matters. The various agricultural experiment stations established in different states gladly receive reports so prepared.

The director and his assistants proceed to study and compare the matters so reported. With their peculiar facilities and opportunities they digest and condense the combined experiences of many intelligent observers. Including with these the results of their own more scientific inquiries, they are enabled to put forth publications in continuous series, very valuable to the farmer or gardener, and thereby promotive of the general prosperity of the country.

There are many new and inviting openings for the further study of plants and plant culture; as, for instance, in electro-culture, now just barely beginning to be practically undertaken; in vegetable and insect physiology, in which much has

been learned, and much yet remains to be explored; and in the very many obscure conditions affecting health and growth, quality and quantity of product, and the like.

As instances of appliances already in universal use amongst market gardeners, yet susceptible of indefinite further modifications and improvement, may be mentioned forcing-houses and hot-beds. Both of these, in their many and very various details of construction and operation, obviously need to be studied as separate (and far from simple) subjects of further inquiry and comparison. On the choice between greenhouse and hot-bed growing, in any case, or between the many different practicable ways of putting up and operating either, may depend many results involving the true or false economy of the plan; and thus the pecuniary success or failure of the grower.

Thus far in the present work I have had in mind, and mainly confined myself to describing, the growing of crops and use of means and processes which I could recommend as successful from a sufficiently extended experience of my own. In the pages that are to follow, I propose to include,

with description of tools and other requisites, some of the various means and appliances that are growing in favour though not yet fully established or that are likely to prove adapted to cases and under circumstances slightly different: in either case worthy of notice as alternatives. These, or some of these, may often prove useful as substitutes for those more familiarly known and used by myself; to which I have given preference for obvious reasons, in the pages preceding.

CHAPTER VII

IMPLEMENTS, ORDINARY AND SPECIAL — FURTHER
METHODS AND APPLIANCES — INSECTS AND PRE-
VENTIVES — FUMIGATION, HOW CONDUCTED —
FUNGI, AND PLANT DISEASES — PREVENTIVES—
CONCLUSION

CONTINUED improvement still appears from year to year in agricultural implements; and some of the tools now used in the market garden and on the farm are of quite recent invention; or have become, through various modifications, entirely different in operation and effect from those in use only three or four 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. The leading American manufacturers of small tools have so nearly perfected the style and quality of these, as to leave practically nothing more to be desired. No other nation can compete with us in the production of handsome, handy and durable articles of this class.

There is a considerable opportunity for choice, even amongst small tools of almost the same pattern and make. No good shoveller 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. 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 after 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.

Tools operated by horse power form a large and

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interesting class of implements, in most of which the steady progress of improvement is very conspicuous. Limits of space will confine us to condensed description — often to a mere brief mention — in treating of these. More detailed description is usually to be had on application to the manufacturers or their selling agents, in the form of elaborate pamphlets, freely illustrated; which (if read with discreet allowance for the bias of their authors) may be consulted with profit for additional information.

The **KEMP MANURE SPREADER** holds the field alone in its class. As already shown (except under unusual circumstances, or perhaps in the cultivation of a very few crops, of which asparagus, melons and tomatoes are the chief examples) — the application of manure by a **SPREADER** is seldom practised by the market gardener because the capacity of these machines is limited to about six or seven cords per acre; but where that amount will suffice, and the spreader is put into service, it gives a very satisfactory result.

We will presume that the use of the **PLOUGH** in turning under broadcast dressings of manure has been sufficiently dwelt upon previously and in the

cultural directions for special crops. After the manure has been supplied and turned under, the next main requisite in preparing for a crop is to pulverize the soil; and since the plough is very efficient in this and other services, in fact quite indispensable, it is manifestly one of the most important of agricultural implements.

Amongst the many varying 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 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 favour 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.

The two-horse land-side plough is 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 endeavour to confirm his judgment by actual trial before purchasing. Much use also is made of the swivel-plough. The large-sized or two-horse pattern 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, will often be found very convenient, especially when 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 subsoiler. 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 earth 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 with spike teeth, and of some others of that class (or approaching it) are about all they have to recommend them. Neither spike teeth, spring teeth, coulters pushed or trailed, nor any similar devices whatever will fully meet all requirements as pulverizers.

Disk or wheel harrows are now commonly employed. One of the earliest of these, the La Dow, was for a time very extensively used, and generally admitted to be the best pulverizer on the market.

Other implements operating much like the La

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Dow, and using similar circular disks, are the Corbin, Climax, Warrior and Reynolds. All have sulky seats and sometimes carry scrapers.

In Clark's Cutaway harrow each disk is in one piece at the hub or centre; but it is shaped at the circumference into six small blades, being cut away with deep triangular notches, to obvious advantage.

The Morgan Spading is the latest and, I think, best of the wheel harrows, for reasons following: Solid disks in one revolution bear, substantially, a constant scraping contact to the earth of about four feet. Cutaway disks present a very similar contact, of about two feet in a revolution. Both styles are usually weighted down to perform their work. The Morgan blade or spade is narrow, rounded and sharp, the end having but about two inches cutting surface, or one foot in one revolution of each set.

The Meeker Smoothing Harrow is employed either for levelling the surface of land, that it may be ploughed evenly, or, after ploughing, to prepare for the seed-drill.

Every practical cultivator knows the style and construction of a good ROLLER. The nature of the service it performs has already been treated

of in preceding pages. A larger use than is ordinarily made of this very important implement is to be recommended.

Next in order of usefulness comes the CULTIVATOR. After the land has been plowed, 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 every one's individual opinion, but I consider the Planet, Jr., 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. The illustrated catalogue of the makers very fully describes its construction, with all its most recent improvements and additional features; and explains the many transformations of which it is capable by interchange and substitution among its different parts, each having special adaptations, and showing great fertility of mechanical contrivance.

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In its general operation, it is wonderfully efficient and economical; it stirs and pulverizes the ground, destroying weeds, giving aëration, and promoting moisture about the roots of 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. Labour with

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an ordinary hand-hoe is manifestly unequal to carrying out the work of this description; it costs too much, and goes over too little ground in a day.

The implement under the name of Planet, Jr., Horse-Hoe and Cultivator Combined, meets the exigencies we have described in a thoroughly satisfactory manner wherever the width of planting permits the use of a horse. 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, furrower and coverer. The side-hoes or plates are reversible, thus giving double wear; and the levers control 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 suiting 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 merely by changing their positions, putting each on the opposite side, the work of a few moments only. Although the present age is

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an age of improvements, and predictions are always rash, I have thought and still 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 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 horseradish and roots, and occasionally for digging celery when it is large and cannot be thrown over with the plow.

The six-tined **FORKS** are the ones most used for pitching manure, digging in hot-beds, and all the work done with a fork; but the spading-fork is

also a very useful tool; expressly adapted to loosening and throwing over garden soil. It is made with only four tines; these are either flat or angular in shape, with but little to choose between the two styles.

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 upward to nine 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 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.

Wheel-hoes for similar service are likewise made and sold by the Planet, Jr., manufacturers, who continue to maintain their well-known high standard of excellence in all goods of this class. Moreover, the wheel-hoes of their design possess unrivalled advantages of adaptation to different kinds of work, by reason of their many possible transformations. These are very ingenious.

The SEED-SOWER or DRILL is one of the most useful and labour-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 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 heavily or lightly as may be desirable.

The Arlington seed drill is altogether the best pattern of seeder ever seen by me. It is very generally used by market gardeners in the vicinity of Boston, and every one who has it in use approves it highly. It has a large wheel, some twenty-eight inches in diameter, with a broad rim, two and one-half inches, which prevents its sinking into the mellow earth, and runs so easily that it can be used all day without fatigue to the operator. It sows fine seeds with perfect regularity, as well as the larger seeds.

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.

Still other seed-sowers are, the Matthews's, the Monitor, the Planet, Jr., and the Iron Age.

For the planting of corn, beans and other seeds of the larger class, and for use on rough or stony land, the need is met by such machines as the Billings's, Albany, or Eclipse. All these are to be run with a horse; and are supplied with fertilizing attachments for depositing, properly distributed, any requisite amount of dry fertilizing powder at the same time as the seed.

Each year competition in market gardening and root-growing makes garden seed-drills more necessary. With their assistance, seed-sowing can be done with so much greater regularity, rapidity, and ease, and with such large saving of seed as well, that the planting of a very small acreage is sufficient to warrant the purchase of a tool which is now made so reliable, simple, and inexpensive.

The Planet, Jr., combined drill, wheel hoe, cultivator, rake and plough was in its primary form a seed-sower; and has been made adaptable to many of the various subsequent operations requisite in vegetable culture by various ingenious cultivating attachments. The change from a seed-drill to a wheel hoe can be made in a few moments by taking out two bolts, and putting on the hoes.

These can be safely set to cut within an inch of

the rows at the first hoeing of small plants from seed. It is then that careful and close work counts.

This method is, of course, applicable equally to all kinds of crops when small. It is not necessary to watch the course of the blades, but only to keep the row exactly spread between the wheels. If desired, in place of the hoe blades, a pair of cultivator-teeth may be used for mellowing the soil effectually, while causing less lateral disturbance of the surface.

Subsequently, when the plants are of larger size, the cultivation is performed by propelling the hoe between the rows (instead of astride). A single cultivator-tooth being attached centrally, in addition to the two hoe-blades the entire space between the rows is covered and worked into mellow condition by one passage of the tool—every weed being destroyed. The width may be adjusted to suit all rows not wider apart than sixteen inches.

By another obvious modification, replacing the two hoe-blades, used in the last described combination, by cultivator-teeth, we obtain a *three-tooth cultivator*, for stirring and mellowing between

the rows without causing any (general) lateral movements of the soil.

The hoe-blades may be attached so as to throw either toward or from the rows. By other and similar changes, it may be readily turned into a ten-toothed rake, useful for light cultivation, or, again, it becomes a handy little plough, for light furrowing and covering. Other details may be gathered from the illustrated pamphlet, issued by the manufacturers.

I consider the Planet, Jr., Double Wheel Hoe to be the most desirable tool. It is built with sole adaptation to the cultivation of the rows. A separate implement is put to service for sowing and covering.

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) and 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.

There are two markers used in marking the beds for lettuce to be grown under glass. One marks five

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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.

A **RAKE-HANDLED MARKER** with ten teeth is also made for sowing radishes or cabbage or lettuce. Mark the rows by drawing the teeth from the back of the bed toward 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.

GREENHOUSE HEATING. We have supplied on a preceding page figures for making ready

estimates of the piping needed. These figures are based upon our own experience in structures of ordinary proportions. For instance, the general cross-section of one of the author's greenhouses in Arlington has dimensions frequent in ordinary practice: Height at the back, 10 feet; height at front, 4 feet; under the ridge, that is, at the highest point of the interior, 15 feet; span, 33 feet. The length of this structure is nearly 400 feet.

These figures, of course, indicate a definite interior cubic content; and from the heating by pipes actually done there I have derived rules which admit of ready application, for all buildings substantially similar; even though somewhat differing in height of front or rear wall, pitch of roof, etc., and of any less or greater length, likely to be erected for the purposes of the vegetable-grower.

A more elaborate calculation may generally be had (free of charge to the person contemplating the outlay), together with estimates for doing the work, from any of the numerous establishments that stand ready to contract for and supply modern heating equipment in its various forms. In such

calculations it has been common to reckon from the glass surface actually present in the given case. A method still more precise consists in reckoning from the whole exposed surface of the structure; glass, sides and ends; rating the two latter as of one-third the radiating effect resulting from a similar surface of glass.

ELECTRO-CULTURE. In my Arlington greenhouse above mentioned is afforded an example of successful and profitable use of the electric light in stimulating plant growths. Four 10-ampere, 45 volt, Brush arc lamps of 2,000 nominal candle-power are employed, when the beds are occupied with lettuce, with the effect of causing the growth of this crop to be maintained continuously instead of being intermitted at night; this saves time, if not quite proportionately, at least in a material degree; accelerating the maturity of the crop, and enabling the cucumber plants, which are to follow, to begin their growth so much the earlier.

I have not yet extended my use of the electric light to the culture of other crops than lettuce; and believe there is ground for thinking that some at least will be injured, rather than benefited by that treatment. Except in the case of lettuce,

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other experimenters have found such results as leave it still a problem whether it can be used to advantage. Some experiments made at Ithaca, N. Y., indicate that it is better to intermit the use of the electric lamps during some portion of each night, and always on moonlight nights. The employment of the ordinary white opal globes — to temper or modify the bare unshaded light (when run continuously) — also appeared, in those experiments, to be beneficial, but I have not used them.

For the forcing of asparagus and other perennials, permanent outside beds are sometimes used. These beds are so constructed as to afford a substitute for the more convenient but highly expensive equipment of hot-houses having water or steam pipes for supply and regulation of heat. As they involve a much smaller initial outlay, they may be considered as affording, under certain circumstances, a more desirable method.

Where such a bed is proposed, the plan generally followed is to surround the bed by a trench bricked up on the outside and filled with stable manure. As often as may be required by the temperature, the manure is renewed. The bed may

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be four or five feet wide, and as long as desired; of course, covered with glass. If made six feet wide, the ordinary 3 x 6 glass can be used, which is more convenient; and, in such case, it is desirable to have box flues leading across through the centre of the bed from one trench to the other in order to promote distribution of the heat. Sometimes there is only one trench, running lengthwise through the centre of the bed, thus dividing it into two narrow ones.

The growth made in forcing-houses enclosing temporary beds is thought, however, to be rather more profitable in the final result. It is usual to make the temporary bed three feet wide; and for asparagus the rows are put one foot apart, with the plants eighteen inches apart in the row. Such close planting will need heavy manuring and close attention.

If a cheap house for forcing asparagus, etc., in early spring is as much as is aimed at, the following plan, recommended in "The American Garden," is as good as any. It may be made either as a double or single span; if double span, 8 or 10 feet wide. Build a wall from the frost line to a foot above ground. Frame and cover with glass. If

the drainage is not good, it must be made so. Dig a trench two feet wide through the centre for a walk. Make an excavation several feet square at one end, to serve for the furnace or stove, and also for the entrance. To heat the beds, carry the smoke around the outside of the bed in flues which are almost entirely below the surface of the ground, the smoke finally passing out of the chimney. Near (and for some distance from) the furnace, build the flue of brick to prevent fire, but the rest construct of boards. In summer, the sash can be removed, and in winter it would be better to apply a mulch and cover the frame with boards rather than the sash, as it would be more apt to give an equal temperature.

Arrange the beds on each side of the walk, and plant as has been above described for temporary beds in forcing-houses. It will be remembered that where so little earth is allowed to each plant it is necessary to manure often and heavily.

PUMPING OUTFIT.—There has already been given a general outline of apparatus for water supply and distribution; and here I repeat the remark that, there being a wide field for choice in selecting and arranging the various requisite

features, and the outlay usually being large, prudence demands a careful study in advance of all attendant conditions and circumstances. Then, after one has made for himself the best scheme he can individually devise, and before embarking his means in the execution of it, it will pay to call in the services of an expert, skilful enough to comprehend the particular case, and to utilize in it the experience of a large professional practice. It will not do, however, to leave all to him; the proprietor must make it his own business, none the less, to understand the whys and wherefores, and to take no step of which he cannot feel he clearly understands the method and the reason.

Amongst the first questions to be weighed and decided is that concerning steam boilers and wind-mills which (or whether both or whether either) — shall be utilized for power. The pump must be one adapted to the power employed. In case wind and steam are both put to service, two separate and distinct pumps will usually be required. With steam, the direct-action horizontal pumps (of which the Deane pattern is a good example) are well adapted for the work. Various makers of steam pumps offer various other patterns which

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are good and efficient, or may be presumed to be so, from the fact that they divide the market demand, with no distinct essential superiority evident in either.

Minor circumstances commonly determine one's choice. If any one pattern were positively and essentially superior, it would not take long for the others to drop out of sight — so thoroughly have the respective merits and demerits of all such apparatus been established by long-continued tests, in widely extended service. Simplicity of action is important, but this condition does not (at least in all cases) exclude belted or geared connections. The best-arranged windmill pumps are “geared back” — though probably the majority of those at present in use work the pump-rod by direct attachment to the crank-pin.

Our own experience, already given, as regards the power to be employed has extended only to wind and steam. But there is yet another means for filling and irrigating tanks or mains. It consists in employing the power of one or more horses, working in a horse-power machine, suitably constructed and solidly geared in combination with a powerful suction and force pump; drafting the

water from the well or supply main and raising it to the storage tank.

This constitutes a complete and self-contained pumping outfit. It has the same advantage over windmill pumping that steam power possesses, in being always reliably at hand. It requires no skilled labour for its operation; a feature which commends it as especially suitable for small cultivators.

As above said, we may be reasonably confident that a pump of any leading style, purchased from a reputable dealer (including, too, its steam cylinders and fittings, if a steam pump), will be found pretty nearly what it is represented. But in choice of boilers, and windmills likewise, neither general experience nor opinions gathered from dealers will be found, perhaps, quite so safely reliable.

Of one point, already dwelt upon, the vegetable-grower may be wholly confident; that, in some way or other, as an indispensable necessity, he must procure water. In making his choice of means for doing it, he will do well to weigh carefully what we have here suggested, as regards alternatives; but on the main matter, there is no alternative — the water must be had, as an indis-

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pensable provision, to save his entire scheme of cultivation from absolute failure; to make it even *possible* to raise crops that will pay.

INSECTS AND PREVENTIVES

So extensive and serious is the destructive work of injurious insects that — except on such land as is kept under continual tith and subjected to constant and thorough cultivation, with judicious rotation of crops — it often seems as if the bugs must get the upper hand of the grower, do what he may. Bugs of one kind or another are found eating everything that grows in the shape of useful vegetables; but they never attack a weed.

Unlike the mildews and other fungous parasites, insects are nowise discouraged and driven off by healthy and vigorous growth of the plants — this is just what they like to find. Sometimes 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.

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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 colour. The grub has eaten away the roots.

Professor Hulst recommends, for suppression of this insect, the kerosene emulsion, one part of the oil to twelve or fifteen parts water. In planting out cabbages the roots should be dipped in the emulsion; and thereafter, at intervals of about two weeks, enough of this compound should be poured around the base of the stalks to saturate the earth to the depth of at least an inch, whether the maggots appear to be present or not.

The same insects that attack young cabbage plants, and 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. If radishes, cabbages, cauliflowers and onions are growing in adjacent rows it has been found that the fly will attack all the rows successively, taking

the radishes as first choice and proceeding to the rest, usually in the order named.

The 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 at this stage 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. Strong caustic lime-water, and concentrated solutions of kainite or muriate of potash are said to be safe and sure remedies when applied in time. A pint or half-pint of the liquid is to be poured upon every plant, making sure of reaching the infected root. This will kill the eggs in the ground as well as the maggot in the root — by simple contact. Plants once seriously affected can hardly ever be saved.

The squash and pumpkin, the cucumber and the

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melon all belong to the Cucurbitaceæ, 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 colour, and glued to the leaves. They are quite easily kept under control by hand-picking. The same means is practised with the tomato-worm and the potato-bug. In the case of the latter, however, the free application of Paris green to the vines is less laborious and equally effective.

Wire-worms are frequently found infesting the soil prepared for the greenhouse; but can be suppressed by the addition of three or four pounds of unslacked lime to the bushel of soil. Similar treatment may be presumed to be beneficial when they appear in out-door culture.

The white grub is a serious source of trouble to cultivators, and no application has yet been found by our gardeners to afford a satisfactory means of destroying it. It seems that if left lying in the ground, in winter quarters, the grub may be frozen to a solid lump, but when thawed out in the

spring will be full of life and vigour. Late fall ploughing, as already recommended on a preceding page, serves to bring it to the surface, exposing it more effectually to the cold and to its natural enemies, thus to some considerable extent reducing its numbers. But the most hopeful treatment yet proposed is that recently put forward by French entomologists, who claim to have discovered a plant-parasite by aid of which lands thoroughly infested with the white grub have been very largely relieved after a two-months' trial, so as to afford a reasonable prospect for the complete extirpation of the pest. This remedy, of introducing a parasite harmless in itself but destructive of the noxious insect, is similar to that which has been so successfully applied in the case of the scale-insects in the vineyards of California.

Insecticides in liquid solution may be applied by use of suitable force pumps, or garden engines (according to the scale on which the operation is to be carried out), equipped with spraying nozzles.

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. An-

other 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; and may be applied by use of a very fine sifter. Metal canisters, having finely perforated bottoms, are made and sold for this purpose, to be used in the same manner as an ordinary pepper caster. These will answer in a small way only.

A capital implement for applying dry mixtures to field crops is the Farmer's Favourite Duster. In operating this device, the left hand is held firm, while the right hand rotates the reservoir of poison and diffuses it effectively.

Any device such as described will, however, be limited to use upon low-growing crops; and, moreover, it will obviously serve to distribute the powder only upon the upper surfaces of the foliage, while many insects, and especially the eggs by which they multiply, may be found snugly harboured on the under side. To meet this deficiency (when the case is one requiring it), use is made of a bellows of peculiar construction, supplied with a convenient receptacle for the powder to be dis-

tributed, from which it escapes gradually into the nozzle of the bellows when operated. It is made in various patterns and sizes, all operating in substantially the same way. There are other implements that can be used, but they are of inferior efficiency, and have nothing to recommend them except in being sold at a lower price. The best, in this as in many other things, will be found the cheapest.

Changing the crop affords a partial preventive against the inroads of insects, providing that the change is to an entirely different family of plants; for it is well known that the continued cultivation in one locality of any particular crop has a tendency to assemble there all its peculiar enemies, and favours their rapid multiplication.

No absolutely complete preventives are known; and cultivators must recognize the necessity of constant exertion, and unremitting use of the best-known and most efficient of those now in use. Due inquiry and fuller knowledge of facts might help to accomplish much toward limiting, if not wholly exterminating, each and every kind of pestiferous insect. Neighbours should combine, both for observation and action; first to devise, and then

unitedly to pursue, such measures as promise substantial relief. For instance, take the case of 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. Perhaps a means of relief less radical and more practicable of execution may yet be discovered; but none is now known to exist.

STERILIZATION OF THE SOIL. This is done by heating the soil to a temperature of 200 degrees or more, and the effect is very pronounced, especially in the working of the soil and the growing of the crop.

It has been found necessary to resort to sterilization to prevent what is known as the "drop" or "wilt" in lettuce.

The best method I have found is to lay pipes on the ground and cover them over with soil to the depth of at least one foot. These pipes are two inches in size, and perforated every few inches to about three-sixteenths of an inch in diameter. They should be ten feet long, and are placed on the ground about one foot apart. The header or cross pipe at the end through which the steam enters is a three-inch pipe and has five or six arms, one foot apart, extending out a few inches to allow

the two-inch pipes to be set inside. Collars are then used to put over the adjoining ends of other lengths of pipe to extend the sterilizing bed. Three lengths of ten-foot pipe, or thirty feet, is sufficient length before another header or cross-piece for steam connection is placed.

Then continue the same as before till you have altogether sixty running feet of bed with three steam connections, one at each end, and one in the middle.

The soil from each side of the bed is then shovelled onto these pipes to a depth of from twelve to fifteen inches, twelve-inch boards having been previously staked up to hold the dirt in. Then turn on the steam, and let it stay on until all of the soil has attained a temperature of 200 degrees. Then shut it off, but leave the soil undisturbed for some time, say three or four hours. You will find that it becomes very soft and can be very easily worked.

It is well to have extra pipes and headers so that while the first section is being sterilized you can be laying another section of sixty feet and have it already for the steam, and so on.

Since I took up this method a few years ago

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a great number of market gardeners have tried it with almost universal success, and I have no doubt that it is one of the most beneficial treatments that lettuce growers employ.

Some sceptics have claimed that the high temperature to which the soil is subjected destroys the bacteria in the soil, which are so beneficial to the process of changing the nitrogen compounds to nitrites and thence to nitrates, which are the available forms of plant food.

This may be true if commercial fertilizers are used; but if stable manure is used this argument has no weight, as there are enough bacteria in the manure to render all the nitrogen available that is necessary.

FUMIGATION, HOW CONDUCTED. Fumigation for the suppression of the aphis or green fly (sometimes called green louse) on lettuce has been already recommended in our cultural directions for growing that plant. We employ moistened tobacco stems in this case. Tobacco in any form is repulsive to the aphis, which is often driven away from lettuce by strewing the stems on the soil about the plants. As a liquid application, a decoction of hot water and tobacco stems diluted to the colour

of weak tea may be used with good results. For the destruction of the black louse, an insect apt to infest the cucumbers in forcing-houses, the removal of the first affected leaves is generally practised. Tobacco fumigation seems ineffectual in the case of this insect.

The method of fumigation is, of course, not applicable to out-door cultivation; but is extensively employed, and forms an efficient means of prevention and relief, in all hot-houses. Vapour of sulphur is regarded as a good means of controlling powdery mildews.

Fumigators offered in the market are made of strong galvanized sheet iron, 20, 24, or 28 inches high, of diameters 13, 14, and 16 inches; the larger size containing one bushel, the others three-fourths and one-half respectively. Each is supplied with a firing-door and a perforated cover, and with convenient handles for lifting and transporting.

In a house such as shown in photogravure facing, which is 33 feet span, 15 feet high at the ridge, and nearly 400 feet in length, containing about 130,000 cubic feet of interior space, I employ four of the largest-sized ones. These require to

be operated only an hour, or perhaps a little more, to fumigate the entire building effectively. Such a fumigation having been repeated three nights in succession, is then intermitted till another time arrives when it seems to be needed, or might be prudently employed as a preventive.

Vapour of sulphur may be obtained by use of a kettle or basin containing sulphur (brimstone) heated nearly to the boiling point, and kept at that heat as long as the process is desired to continue. A small kerosene stove and an iron kettle form a convenient and manageable equipment. Vapour enough should be generated to visibly fill the house or apartment, and give off a noticeable odour. But the sulphur must be carefully watched to prevent its taking fire, in which event fumes would arise destructive to all plant life, and might do extensive mischief.

Probably the two worst insects we have to combat are the red spider and the white fly. They both can be killed by use of cyanide gas.

An ounce of cyanide used with two ounces of sulphuric acid and four ounces of water to 2,000 cubic feet will kill the white fly and not injure some crops. But great care must be used, as the

gas is very deadly. It is better, perhaps, to use the above proportion to 4,000 cubic feet to start with, with an exposure of six minutes, and if not successful try it stronger next time. I have used the above formula successfully on a tomato-house (one ounce to 4,000 cubic feet) and kept the house closed all night without injuring the most tender growth.

But for red spider there is no method of killing the spider and saving the crop. The best way is to check him all you can. Moisture is a check to breeding, but it is not practicable to spray cucumber vines too much. I have found the best way to be to cyanide after the crop is through bearing, using a proportion of one ounce to 200 cubic feet, and keeping the house closed all night. This should be repeated in seven days to kill the little ones that have hatched out. And further, keep your houses clean. Keep them painted every year, and don't grow cucumbers in the fall, for if you do you are bound to have spiders in the spring.

FUNGI AND PLANT DISEASES.—PREVENTIVES. Disease in plants manifests itself in various forms, amongst which we recognize two distinct classes; one due to the presence of animal

parasites, insects and their larvæ, such as above described; while the other includes smut, mildew, blight, rust and all similar, fungous or vegetable, parasite growths, which we group under the general name of Fungi.

It is often not clearly evident to which of these two classes, or whether, indeed, to either of them, the trouble really 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, corresponding to *saprophytes* among fungi — 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 morbid condition, however originating.

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: 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. It may reasonably enough be assumed that plants are liable to forms of disease attributable neither to vegetable nor animal parasites, but arising much like disorders in animals, as from imperfect nourishment, excessive cold or heat, lack or superabundance of moisture and the like unhealthy conditions. Mismanagement of heat, or moisture, on a forced crop frequently entails a blight; or promotes mildew, as elsewhere described in treating of the culture of lettuce. A succession of dark days, depriving the plant of sunshine, exerts a similar influence; unless relieved by aid of the electric light, now beginning to be used.

So, too, some harmful element may exist in the soil or fertilizer, causing the plants to languish; and thus again the spores of fungi may be enabled to fasten upon them. It is good policy, alike as

against the fungous and all other disorders, and on general grounds as well, to put all the vigour we can into the growing plants. We should also bear in mind the great importance of prompt and efficient action wherever disease is apparent; as it will surely and rapidly extend itself, unless controlled.

Owing, perhaps, to the fact that the varieties and habits of insects have been more obvious objects of study, there has been collected, thus far, comparatively little scientific knowledge concerning fungous diseases of plants, and their appropriate remedies; but vegetable-growers have, from practical experience, acquired much valuable information (though leaving much yet to be learned) and have been led to devise and apply remedies, some of which are very successful.

Fungi that live upon dead and decaying substances, such as toadstools, black and blue moulds, and the like, are of little interest to the cultivator; but there is another class, of entirely different habit, that attacks living plants, pushing its own rootlets into the growing leaf or stem or root, and taking its sustenance from the juices so obtained. Plants grown in forcing-houses are especially subject to

these attacks. Among these fungi are the downy mildews, like those on spinach and lettuce, and the powdery mildews, such as attack cucumbers.

They multiply through the agency of spores, as plants by seeds. Some of these spores develop with great activity in a summer temperature, natural or artificial, when other conditions are favourable, but are readily destroyed when exposed to severe cold, long-continued drought, etc., or to certain artificially created conditions. Others, however (called resting spores), more sluggish in habit but of more endurance, are found to remain unaffected, preserving the species; so that their complete extinction in any locality is not to be expected, in the present state of our knowledge.

As a rule, when a vegetable parasite fastens upon a plant, it is next to impossible to kill the parasite without destroying the plant by the same operation. It is obvious, therefore, that no treatment can be judicious which is not mainly preventive.

Healthful condition is, as already urged, an important means of prevention. Another, which has been often recommended, but far too little attended to, consists in the removal and destruc-

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tion of all leaves, twigs and dead growths which may contain the spores.

The various liquid preparations for spraying and so protecting the foliage and succulent stems, by way of which the spores are apt to gain footing on growing plants, generally operate by coating the surfaces with a thin film of some substance in which the spores cannot germinate, while yet it is harmless to the plant. The spraying should be repeated, at intervals of ten or fifteen days at most, at such time and as long as any danger of an attack is to be apprehended. This time varies with the different habits of different fungi; further knowledge than we now possess on that point will doubtless be gathered as time goes on.

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I AM very sure that much in the preceding pages will be directly helpful in the way of practical guidance to any one engaged, or about to engage, in the business of vegetable-growing. Indirectly, also, the cultivator or student will be benefited, if, by their perusal, he is stimulated to a livelier sense of the variety and importance

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of the multiplied details belonging to his chosen avocation.

Wherever there has not been opportunity for the full discussion of any subject, in adequate proportion to its prominence and practical importance, I have endeavoured to make such suggestions as will lead the thoughtful reader to inquire further and learn more.

The rules herein laid down are, in compact form, the net results of extended practical experience. They are no haphazard inventions, of doubtful utility, as are too many of the instructions and cultural directions which, from time to time, obtain more or less currency amongst horticulturists.

Learners, in conducting experimental work of their own, or in considering results as reported by others, should beware of hasty conclusions. There are always manifold obscure conditions affecting largely, perhaps controlling, the outcome of crop experiments. Of these conditions, the very ones least recognized and understood may have far more to do with results than those they have been most intent on observing.

Results of vegetable-culture will always be largely affected by climatic conditions; and these,

of course, are variable from season to season. Crops will sometimes fail utterly — and again sometimes succeed astonishingly — for no visible reason in either case. Manure effects, especially on soils naturally poor, are apt to be very difficult of prediction or subsequent analysis: the only safe general maxim being the common-sense rule, to feed the plants abundantly and let them find and take what they require.

The conditions of greenhouse and hot-bed culture are more definitely known, and can be more exactly fulfilled, than those of open culture, for obvious reasons. It is in these forms of vegetable-growing that the largest recent advances have been made, and in which the most important future improvements seem likely to be developed.

As regards choice and rare winter-products of forcing-houses, the market demand, though steadily increasing, is but small as yet. Those who have access to the larger markets are, of course, comparatively far better enabled to make suitable disposal of such products. Others will be limited, for the present, to producing the more common kinds, such as lettuce, dandelion and

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parsley, for which a more general demand exists. The rarer sorts, such as asparagus, cucumbers, cauliflowers and tomatoes, being still regarded as special luxuries, can be freely disposed of only in the large cities.

That the cultural directions foregoing and other matter presented leave much to be learned, and are, taken by themselves, only partially adequate to the guidance of the unskilled cultivator, is only what must be true of any similar manual. It would be hard to name a subject open to wider research and capable of greater advances than is that of plant-growing, even when limited to its most practical aspect.

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.

THE END

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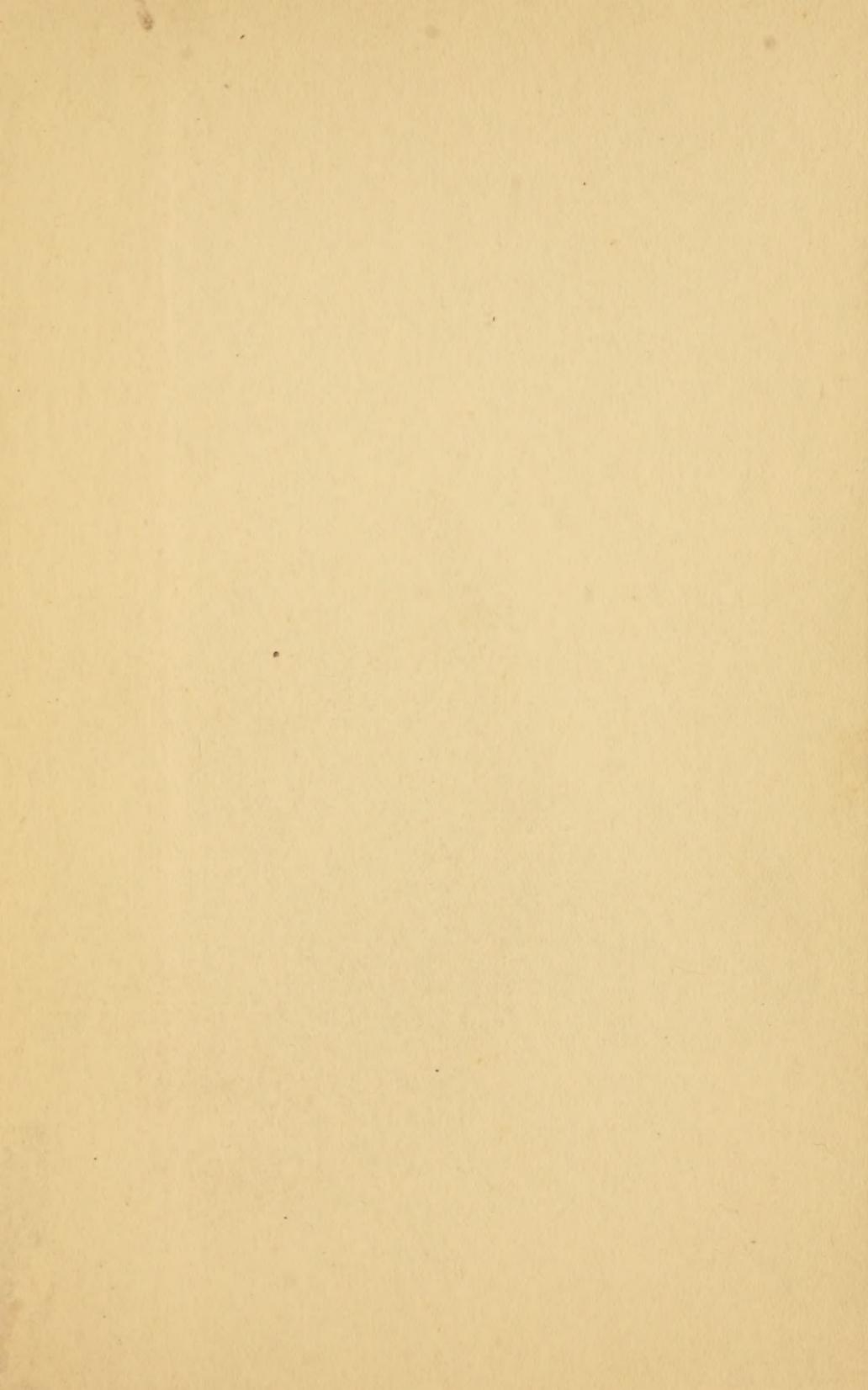
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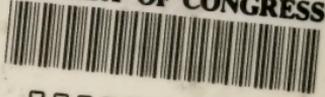
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