The BEGINNER'S GARDEN BOOK

ALLEN FRENCH

THE MACMILLAN COMPANY
NEW YORK · BOSTON · CHICAGO · DALLAS
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OUT OF THE GROUND

THE
BEGINNER'S GARDEN BOOK

A TEXTBOOK FOR THE
UPPER GRAMMAR GRADES

BY

ALLEN FRENCH
AUTHOR OF "HOW TO GROW VEGETABLES"

New York
THE MACMILLAN COMPANY
1914

Set up and electrotyped. Published May, 1914.

Norwood Press
J. S. Cushing Co. — Berwick & Smith Co.
Norwood, Mass., U.S.A.

PREFACE

One of the most striking educational movements of recent times is toward the interesting of children in gardening. State boards of education, local school boards, and local home gardening associations have all encouraged and superintended the work. The advantages are very plain, and in both town and country two are chief. In the first place, children, whether through an awakened love of flowers or an understanding of the economic value of vegetables, are brought into direct contact with nature, and must necessarily profit, mentally and physically. In the second place, children are kept busy who otherwise might be idle through the weeks of vacation. They learn to work, they understand the values created by work, and they gain from this both self-respect and respect for property. Gardening thus becomes a lesson in civics. In addition, in country towns intensive agriculture, our dependence in the future, must be stimulated by gardening. The garden movement is, for all these reasons, of even national importance.

This book is offered as a textbook of gardening for the upper grammar grades. It covers not merely the school work indoors and out, but also the work of gardening at home. Thus it has a wide field, and at the same time follows the natural activities of the school year. From his own knowledge of gardening, as well as from his acquaintance with the school and home gardening work at Concord, Massachusetts, the author is certain that the book is practical.

The divisions of the book explain themselves. Beginning with the fall work at the opening of school, and following the

course of the year, the garden cycle is completed. The teacher is advised to study beforehand the indoor experiments, in order to make sure that the materials are such that the lesson can be properly explained. During these experiments plenty of seeds and seedlings should be at hand.

While the book is designed for use in schools, it need not be so confined. Its scope and its practical treatment fit it for the use of all beginners in gardening, of whatever age.

Acknowledgment is made to Professors L. H. Bailey, G. W. Warren, and C. A. Stebbens for the use of illustrations from their books. And both author and publisher take this opportunity to thank J. M. Thorburn and Company, seedsmen, of New York City, for supplying numerous photographs for use in this volume.

The author desires to acknowledge with thanks the assistance of Wilfrid Wheeler, of Concord, Massachusetts. His experience as a practical horticulturist, as well as his knowledge gained as member of the Concord Home Gardening Association, of the school committee of the town, and of the State Board of Education, have made his advice in planning and writing the book of the greatest assistance.

ALLEN FRENCH.

CONCORD, MASSACHUSETTS,
March 1, 1914.

TABLE OF CONTENTS

SECTION I

THE AUTUMN WORK

SECTION II

THE WINTER WORK

SECTION III

GARDENING UNDER GLASS

SECTION IV

THE REAL GARDEN

APPENDICES

THE BEGINNER'S GARDEN BOOK

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SECTION I

THE AUTUMN WORK

CHAPTER I

The Purpose of a Plant

It is interesting to consider that nations ceased to be savage when they gave up wandering and settled down. They could not settle in one place without a constant supply of food, and this they got by farming. Farming, or agriculture, which thus supports civilization by supplying men's needs, led the way to gardening, or horticulture. Gardening supplies pleasures in the shape of delicate food or beautiful plants. It may be made a business, and is then one of the healthiest and most interesting; or it may be carried on in one's spare time, for pleasure; or it may be made to give both pleasure and profit.

A garden may be called a plot of ground in which plants are made to do their best. Gardening therefore means the careful rearing of plants, giving each what it most needs. This rules out laziness and indifference; it calls for thought and pains. Gardening for beginners should not mean hard work unless it is carried on for money or unless one has mistakenly laid out too large a plot. Properly carried on, gardening should mean a little regular work each day.

Although at first sight garden plants are entirely unlike, they are alike in certain ways. Each has root, stem, and

leaves, and each has the same purpose. This purpose is of course unconscious; but it is nature's chief care that each plant shall make seed. The seed is made by means of flowers. If man did not interfere, the plants that are alive to-day would go on, year after year, blossoming and making seed

FIG. 1. — THE CHILD AND ITS GARDEN.

A garden should be in proportion to the strength of the gardener. Note the child's small patch.

from which other plants would grow. This is true not only of plants that sprout and die within a single summer, but also of a tree that will live a thousand years. And although nature has other ways to make plants, of which man takes advantage, and although man interferes with the natural growth of plants in the strangest ways, such as making a plant grow from a leaf, it is still true that the most important

purpose of every plant is to make its seed. The means by which it does this we need to study.

When root and stem and leaf are all doing their work together so successfully that the plant has more strength than it needs for mere living, or growing,[1] it prepares to make a flower. Somewhere on its stalk (and some plants, like the lettuce or the foxglove, will make a stalk if they haven't one already) it makes a flower-bud. This presently, on its own

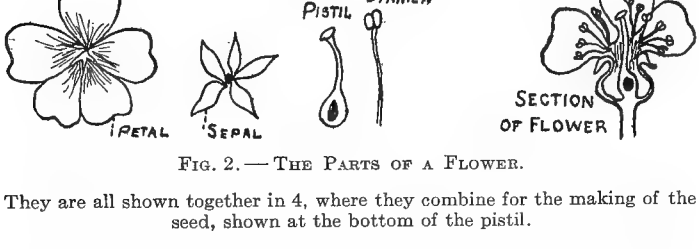

FIG. 2. — THE PARTS OF A FLOWER.

They are all shown together in 4, where they combine for the making of the seed, shown at the bottom of the pistil.

little stalk, makes a blossom. And the blossom has four important sets of parts.

Outside of all, seldom to be used again when once the bud has opened, is a set of usually green sepals called the calyx. It protects the bud.

Inside the calyx is a set of colored petals called the corolla. When once they open out, they are the most noticeable part of the flower, make it different from every other kind, and serve to attract bees. It is the corolla that we usually admire in a flower.

Nature, however, does her work through the two remaining sets of parts. First are the stamens. There are usually three or four, and often many, to a blossom. They are made

[1] This is the natural course. When a plant is injured, it often flowers.

of little stalks, called filaments, on which are fixed heavier parts, called the anthers. The anthers make a fine dust, called pollen, which the wind or the bees can carry about.

The stamens are ranged in the middle of the blossom, around the pistil or pistils, the second important part. A pistil is a stalk, with a somewhat sticky tip, and a hollow base called the ovary, which may be translated egg-holder, or seed vessel.

The scent of the flower, and its nectar, from which bees make honey, serve to attract insects, and these carry the pollen from flower to flower.

This description suits very well a flower that is regular in form, such as a Shirley poppy. Here you can see at once the various parts: the calyx below, the delicate and beautiful corolla, the stamens in their circle, adding greatly to the beauty of the flower, and in the middle the pistil. But as soon as you find a double blossom, such as one of the double poppies; or when you see an irregular flower, such as the nasturtium or sweet pea; or when you study a compound flower, such as the daisy or the scabiosa, then the parts are more difficult to distinguish. Nevertheless, the description is still generally true, although flowers vary in innumerable ways. It may be that some one part is missing; that by having the stamens and pistils on different blossoms, two flowers are needed to do the work of one (as in the corn and some strawberries); or that the flower is so changed in looks as scarcely to seem a flower at all. Nevertheless, there will always be at least

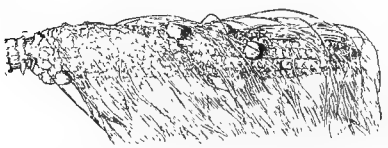

FIG. 3. — Many of the pistils of this ear of corn received no pollen.

the pollen and the ovary, with the parts that hold them, and some other parts as well.

For simple study, in plants easily procured in the fall of the year, the following are best: among flowers, poppies, nasturtiums, pansies, petunias, snapdragons, sweet peas; among vegetables, squash and tomatoes.

The work of the flower is as follows: The pollen must first be carried to the stigma, or sticky part of the pistil. This is done by means of the wind, by simply falling downward, or by the help of bees, who carry the floury pollen upon their fuzzy legs. Once a pollen grain has reached the stigma, the grain opens and its contents work into the pistil until they reach the ovary. Here they find an ovule, or the beginning of an egg or seed, which cannot be complete until the pollen reaches it. The two unite, and at once the seed begins to form. When complete and ripe, the seed is ready to make a new plant.

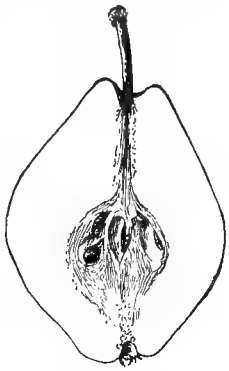

FIG. 4. — The seeds and thickened calyx of the pear.

Seeds take hundreds of different forms. If we look at an apple, an orange, a bean, and a peanut, we shall begin to see how widely seeds differ. The apple and orange are not seeds alone; they are fruit as well, for fruit is the seed and its *envelope*, or covering. Here are some common examples of the different kinds of fruit.

The apple and pear contain seeds, but their chief part is the calyx, which during the summer becomes fleshy.

The strawberry's pulpy part is the end of the flower-stalk, which is thickened like the calyx of the apple. The seeds are carried on the surface.

The fig and pineapple are the crowded parts of many flowers, ripening on the stem which held them all.

FIG. 5. — Balsam pod.

Most changes in the form of fruits are made by the wall of the ovary, which is called the pericarp. This changes in all possible ways. With the bean it becomes thin and dry, the pod. But with the gooseberry it becomes fleshy, inside the outer covering. With the peach the inner parts of the pericarp become most strikingly different, one part being fleshy and delicious, the other stony, to protect the seed.

Sometimes the pericarp seems to become a part of the seed, its skin, as with the wheat and corn.

Sometimes the pericarp is surrounded, or partly surrounded, by another covering, as with the burr of the chestnut, the sheaf of the hazel-nut, or the cup of the acorn.

FIG. 6. — Balsam pod exploding, scattering the seed.

Fruits often combine many seeds. This is true of the squashes and melons, the ear of corn, and the tomato. Fewer at a time are to be found in the legumes, or podded plants, such as the pea. The cones of pines and firs contain seeds at the bases of the scales.

Considering this list of very different fruits, one easily sees that the seed does not always come bare and naked from the plant. Indeed, many seeds fall from the plant while still embedded in the fruit, and

become free from it only when it rots. There are some pericarps, however, which cling to the plant rather than to the seed. Such pericarps open and allow the seed to escape, as with the ripe pea and bean, and all legumes. The larkspur, the columbine, and the poppy all do the same, and the ripe seeds are shaken abroad in order to lodge in the earth.

Until man left his wandering, and took to settled life, plants took care of the work of seeding themselves. The seed fell by chance, and struck root if it could. Such seeding still takes place in all wild spots, such as the woods and the fence rows, where the trees and the weeds are always struggling for a chance to live. But thousands of years ago men discovered that the best way to provide vegetable food was to grow plants in good earth, with plenty of space, and protected from struggle. The first step to this was the saving of seed.

Review Questions

1. When a savage tribe gives up wandering, why does the cultivation of the soil become necessary?
2. Explain the difference between gardening and farming. What is a garden?
3. In what way are all plants alike?
4. What is the purpose of a plant?
5. What does a plant need before it can flower?
6. What are the parts of a common flower? What are the necessary parts? The work of a flower?
7. What is a seed? A fruit? Give examples.
8. In what ways do plants scatter seed?

CHAPTER II

The Saving of Seed

One of the most important things in gardening is to have good seed. This is because good plants cannot come from poor seed, and because it is scarcely worth while to labor over poor plants.

A hundred years ago almost every gardener and farmer saved his own seed. Nowadays the growing of seed is a business in itself. It is a work of great care, and most people find it simpler and cheaper to buy seed than to grow it.

Nevertheless, nearly every one can profitably save some seed. It is so easy to pay a few cents for a packet of seed that we do not recollect that with certain kinds it is cheaper to save than to buy. People are said to be wasteful nowadays: here is a chance to be thrifty. Again, by watching for especially fine plants, we may be able to save a little finer seed than we can buy. And finally, by saving seed of the same kind for a few years we may develop plants which will do better in our district than any that can be obtained at the store. These are three very good reasons, then, for saving certain kinds of seed.

I do not mean that we should try to make, that is, to *breed*, new kinds of plants. That is a difficult work. The plant-breeder *crosses* two kinds of plants; that is, he brings the pollen of one to the pistil of another. The parent plants he chooses for the qualities (color, shape, size, flavor) which he wishes to mix together in the new plants. He saves the

seed, raises plants from it, and keeps only those which suit him. These he crosses again, saves the seed again, and so goes on, year after year, in the work of producing the kind of plant that he has set his heart on. In this way, by the patient work of men whose names we seldom hear, were produced the fine varieties which any one can buy for little money.

The work of *selecting* seed is different. We let the plants breed as they will, but keep on the watch for especially fine ones of the kind that we like best or need most. From these we save the seed, hoping for at least as good results next year. We depend, therefore, a good deal upon accident, but also much upon our own taste.

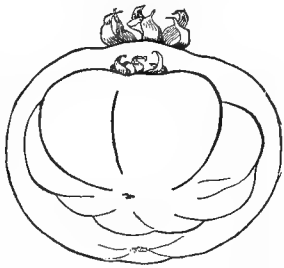

FIG. 7. — The new round tomato, as compared with the smaller, grooved, older kind. The result of breeding.

For any one with a garden that is near other gardens, as is a school plot, the value of saved seed is often very slight. For the wind and the bees are always busy in crossing neighboring plants, so that a single plant in one garden may have been pollenized from two or three neighboring plots. Seed from such plants cannot be depended on to be as good as their parents. If one is thinking of saving any kind of seed, then, he is best off if the plants grow by themselves, at a distance from similar plants, which might bring unwished-for qualities. From a field of the same kind of corn, from tomato plants which stand by themselves and which all come from the same packet of seed, or from poppies which have no poppy neighbors, it will probably pay to save the seed of the finest plants.

Again, from certain kinds of plants we shall scarcely be willing to go to the trouble of saving seed. Plants that need two years to grow, such as the parsnip, take up too much soil and time. The seed of some plants, such as rhubarb, do not certainly produce plants like their parents, for they are likely to be worse. The seed of other plants, like the peony, take from four to six years to make flowers, and there is a shorter way to get flowering plants. And the seed of a tree is of very little value to most of us, since to grow a tree from seed will tax the patience of any home gardener, when several years can be saved by buying one.

Nevertheless, with annual plants whose seed are easy to handle, seed saving may be worth while. Some of them we grow for flowers. If you have a poppy, or a sweet pea, or a petunia, whose beauty you especially admire, the seed may be saved. Biennials and perennials, which live more than a year, also yield seed worth saving. So with the larkspur, columbine, and foxglove. But remember always that if other such plants are near, the result may be disappointing. The colors may be different, and the blossoms smaller.

More important in many localities is the saving of vegetable seed. Everywhere throughout the middle West are associations for the saving of seed corn, a single perfect ear of which has been known to sell for two hundred and fifty dollars. The seed of tomatoes may well be saved by any one who has found plants which do especially well for his soil. Further, with plants which are not grown from seed, such as the potato, it may prove very wise to save tubers for growing again. In all these cases the amount of seed saved is but a very small part of the whole crop, the rest of which may be used in other ways.

The saving of seed requires alertness and good judgment

more than any other qualities. The gardener must be alert to find the plants from which to save seed, and to gather it at the right time. His judgment shows itself in knowing what to look for in a plant, and in recognizing it when it appears. For example, one who wishes to save the seed of corn should know the looks of a healthy plant and a good ear; he should always be on the watch for them, he should protect them while growing, gather them while ripe, and dry and store them properly.

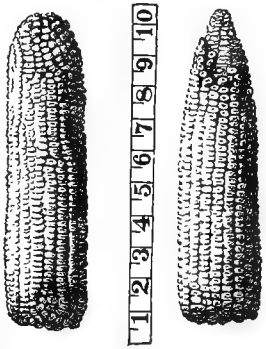

FIG. 8. — A good ear of corn and its ancestor. The result of selection.

Study, then, any kind of plant from which you wish to save seed. Whether it is a columbine or a potato, learn what a healthy one is like. When you have found such a one, protect it and watch for the proper time to gather seed. The time varies a good deal. There is, for instance, no hurry about corn. When the seed is ripe, the plant is nearly dead. The ear may remain on the stalk for some time afterward. But a columbine, or poppy, or lupine may suddenly shed its seed. Know what your plant is likely to do. Generally it is the flower that sows its own seed, and generally the vegetable that can wait for a long time. But learn the right time for picking, watch for it, and then — pick. Gather the whole pods, or the whole fruit.

Once the seed is picked, it must be treated. If small, keep it in a tin box. Put it daily to dry in the sun, until it is thoroughly dry. If it is a podded seed, lay the pods on white paper, so that if the seeds fall out they may be gathered easily. If it is a fruit like a squash, or is an ear of corn, there

is no better way than to dry it whole and keep it so. As we shall see later, there is an especial reason for keeping the corn seed on the cob until it is wanted. With a pulpy fruit like the tomato, time will be required for it to become so dry that the seeds will separate out.

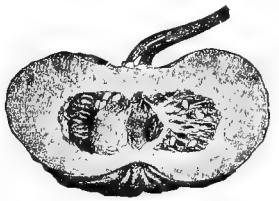

FIG. 9. — A SQUASH AND ITS SEED.

When the squash is to be eaten, scoop out the seed and dry it.

And once dry, the seed must be stored. To begin with, label it clearly. Then, as it should be dry all the time, protect it from moisture. Keep it next from warmth. For moisture and warmth will cause seed to sprout or to spoil. It may be well, also, to keep seed from the light. A cool, dry cellar or closet is a good place in which to store it. But here or anywhere it must be kept from mice, for they will speedily ruin seed or tubers.

The watching of plants which you have raised from your own seed is very interesting. It is a test of your judgment. It is satisfying to find that your poppy, or your corn, is as good as, or even perhaps a little better than, the plant of last year. Your money has been saved to good purpose, and your work is well paid. Of course you haven't a new kind of plant; we leave that to the breeder;[1] but of your kind you have a new *strain*. When for a second time you save the seed, you can feel almost sure that the seedman himself has none better. Moreover, you know well at least one department of gardening. If you carry the work further, you may be well rewarded, indeed. Only a few years of careful selection may prove you to have a strain of seed which,

[1] Of course pure accident, such as sometimes happens, may produce in your garden a new and fine variety.

in your soil at least, is the best possible. Thus, starting always with good seed, a farmer boy may develop a strain of corn, a vegetable gardener a strain of tomato, a flower gardener a strain of petunia,[1] which will make the crops notable in the neighborhood.

Review Questions

1. What is the work of a plant-breeder? A plant selecter?
2. In what cases is it not wise to save seed?
3. From what kinds of plants will it pay to save seed?
4. What do we need in order to succeed in this work?
5. When is seed to be gathered? How is it to be treated? How should it be stored?

[1] Flowers whose seed is worth saving are: poppies, Canterbury bell, columbine, forget-me-not, foxglove, hollyhock, larkspur, lupine, mignonette, nasturtium, petunia, phlox, portulaca, sunflowers, sweet pea, sweet William. Vegetables are: corn, beans, muskmelons and all squashes (including cucumber), okra, peas, pepper, tomato, and egg plant.

CHAPTER III

Picking

The picking of one's flowers or vegetables depends partly upon the purpose. Let us first consider vegetables.

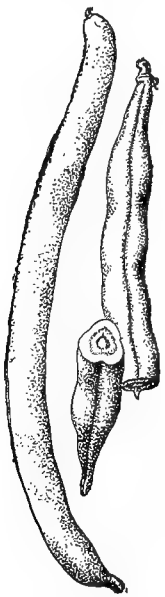

Fig. 10. — "Snap" Beans.

If from good seed, and if not too old, they have no strings at all.

As vegetables are grown solely for food, and as their garden is seldom admired except for neatness and thriftiness, the picker does not hesitate to take what he needs wherever he finds it. What he wants is a full basket. But as he picks there are certain things he should remember.

In the first place, his vegetables should be young. Some of them, such as okra, kohl-rabi, and string beans, are ready to punish him if he leaves them too long, for they become stringy. But other plants, even though they do not become stringy, should be picked just as early as these. The basket fills faster, to be sure, if the peas and corn and summer squash have been left to grow to their full size, but the vegetables are no longer delicate. It is safe to say that most vegetables should be picked before they come to their full size.

In the second place, vegetables should be picked "at the last minute"; that is, as late as will give the cook proper time to prepare them

for the table. It has been proved that corn loses its sweetness from the minute it is picked; it should be picked if possible, therefore, just before it is to be cooked. Other vegetables, except lettuce, do not so soon lose their freshness; but there is no reason why a home vegetable gar-

FIG. 11. — Pick carefully. By careless dragging at pea vines the picker may either tear them from the trellis or loosen them in the earth.

dener should ever pick his vegetables the day before they are used. Generally they should be picked early in the morning, before the sun has been on them. And this time, which is good for the vegetables, is good for the gardener, too.

Unless his supply is very short, the gardener should bring to the house only perfect vegetables. To save his supply, he should learn how much to pick for each day's needs.

The vegetables should be brought neat and clean to the house. All dust should be washed or wiped off, the roots should be cut away, and the outer leaves of such plants as lettuce and cabbage should be picked off. If this is a help to the cook, it is also a help to the gardener. Roots, leaves, and dead plants should all go in an out-of-the-way pile, the compost heap, which in the course of time yields good material by the rotting of the refuse. For this pile, also, the gardener should demand from the cook all parts of the vegetables that she does not use. The pods of the peas, the husks of the corn, all can be thrown on the compost heap.[1]

The flower gardener has a different task. In the first place, she (for it is pretty safe to assume the flower gardener is a girl) must consider not only what she brings to the house, but also what she leaves behind. The garden should always show flowers; therefore it must not be stripped. Yet no faded flowers should be left on the plants. Besides appearance, there is another reason for this. If flowers are allowed to go to seed, the plants are likely to cease blooming. So even if flowers are not wanted for the house, the gardener should (except where seed is to be saved) make a daily round of the garden, picking off the faded flowers. These should not be dropped on the ground, but carried to the compost heap.

When flowers are wanted for the house, they should be picked with care. Buds too young to open, and old blooms which will soon fade, should both be avoided. Pick the just opening blossoms, those which are nearly open, and the flowers which are in early bloom. Thus you will have a bunch which will both show variety and last for some time.

[1] There is no such danger of breeding flies in the compost heap as there is with manure.

Pick with the flower some of its own foliage; or if this is not in good condition, pick stems and leaves of another plant.

In the house, arrange the flowers according to their nature. Keep together those of similar colors, or be sure that those of different colors harmonize. For the long-stemmed, choose tall vases; for the large-flowered, choose large vases or bowls; for small and short-stemmed, choose small or shallow bowls. Here is where, by the study of problems which change almost from day to day, much taste can be developed. The subject is so large that it cannot all be explained here. But only a little advice can be given.

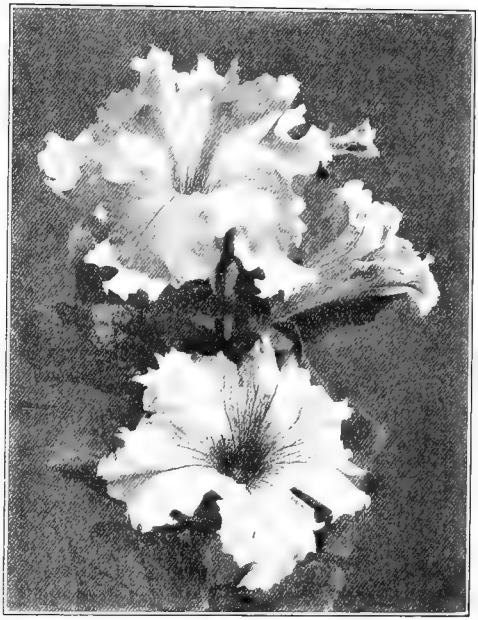

FIG. 12. — Flowers never look well without some of their leaves.

Generally speaking, do not crowd the flowers. Make them look as if growing naturally. To this end, the foliage which you have picked will help. Set in among the flowers, it will give the appearance of naturalness, and will prevent crowding. You will improve the arrangement if you shorten

some of the stems, so that the flowers appear at varying heights. You can do better, of course, if you have certain helps which you can buy cheaply. Such are perforated disks of glass: the holes keep the stems upright, and the glass is invisible in water. Such also are pieces of coarse wire netting, galvanized, rounded to fit a bowl, and swelling upward in the middle. These, too, help to keep the stems in place. But you yourself can make similar devices. A long ribbon of sheet lead, bent into a rosette, will help to hold tall flowers upright. From a piece of netting you can make a wire frame of your own. But the foliage, properly used, is almost enough of itself.

To arrange flowers well is an art which many neglect because they never even heard of it. Flowers, beautiful as they are, show a little obstinacy when handled wrongly. If merely thrust into a vase, they are likely to refuse to look well. Both the eye and the fingers should be trained to the work. The one who spends an extra minute thinking, and another in arranging, will make her vase look the best. Two watchwords should always be borne in mind during the work. One is naturalness, the other (and it is almost the same) is simplicity.

Once arranged, the flowers should be placed wherever they show best, on mantel, book-case, or table. Consider their color and the color of the room, and do not put flowers where they will not harmonize. Don't put them where other things belong, as in the umbrella-stand or the fireplace.

Flowers for the sick-room should be simple, quiet in tone, and faint in odor.

The ends of the stems of house flowers should be cut at least every other day (every day is better) and fresh water given. Flowers which are on the point of fading can sometimes be refreshed by putting them in water as hot as the

hand can bear. As soon as the flowers fade, they should be thrown away. Those which are still good may be rearranged, and others may be cut.

Picking for the market will be different from picking for the home. Yet the differences are not so very great:

With the vegetables there are certain customs to be observed. In some localities or seasons radishes, carrots, beets, onions, and other crops are sold bunched together with their tops on. Where this is the habit, the gardener should recognize and follow it carefully. Let him have his bunches of full size. At other times or places these vegetables are sold by measure or weight. All such customs the gardener should recognize and follow.

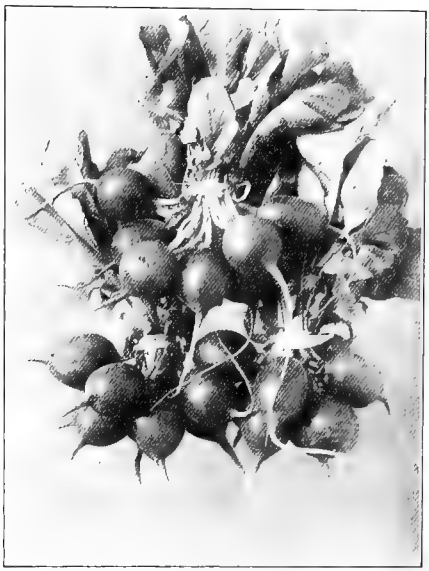

FIG. 13. — Radishes bunched for sale.

But in any case certain things must be remembered. First, the vegetables should be as nearly perfect as possible. Leave behind all split carrots, rusted beans, uneven corn. Next, the vegetables should be as nearly as possible of the same size and plumpness. If they vary, grade them into two lots, and sell at different prices. Then, never sell, if you can help

it, vegetables that were not picked within twelve hours. Rather use them at home. Start each day with a fresh load, and build up a reputation. This, of course, does not apply to cabbages, potatoes, and vegetables that similarly keep a long time. And if you must offer vegetables for sale a second time, freshen them overnight by washing or watering them. But keep them from getting soggy, and don't be surprised to learn that you are harming your trade.

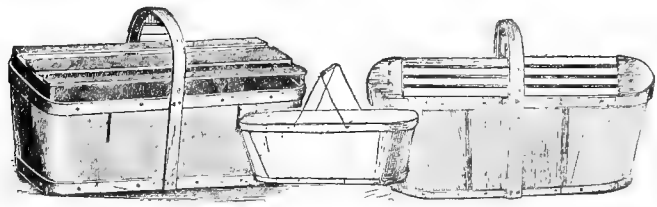

FIG. 14. — Flowers or vegetables for the market should be kept fresh in baskets. These are for expressing.

Pack vegetables carefully in separate baskets or boxes, and keep them from the sun.

Flowers for market should always be perfectly fresh. For this purpose they should be picked as early as possible; then, before the ends of the stems have dried, they should be stood in water for an hour. Thus they will keep longer. They ought to travel in deep baskets, protected from injury, and from the sun.

The bunching of flowers for market should be done as carefully as for the house. They should be grouped so that colors harmonize, and should not be too tightly bunched. A little foliage should be used to prevent crowding and give the appearance of naturalness. And it is well to pack the bunches according to color harmony. They will sell the better for this.

The work of choosing and preparing flowers and vegetables for an exhibition is important, for it may add a public "Well done!" to the season's work.

Exhibitions of vegetables do not vary very much. Prizes offered usually are for the best three, or four, or twelve, of one thing and another, with quarts of beans or peas in pods, and sometimes for the "best collection of vegetables, any number of varieties." Size is sometimes important, but usually quality is most considered. If the vegetable gardener is wise, he has been studying his plants for some weeks, planning which products he can use. Indeed, the spring planting is often done with the exhibition in mind, and much of the cultivation has been carried on with the idea of having the right vegetables ready at the right time. When it comes to picking, there are certain things to remember.

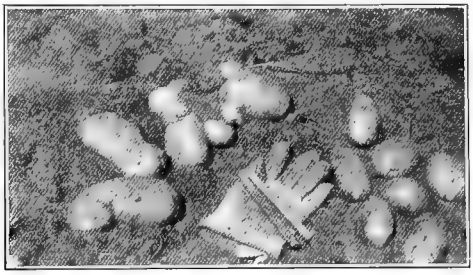

FIG. 15. — GRADED POTATOES.
Which of these groups is the more attractive?

First, the vegetables should be of the proper size. They should not be too small, nor, in the opinion of many judges, too large. A monster pumpkin is all very well; but when we come to monster cucumbers, or celery, and certainly string beans, the flavor is likely to be coarse. If more than one of a kind is shown, the sizes should be, if possible, exactly the same.

Second, the shape should be what is proper to the variety, and not suggestive of another. In an exhibition of more than one of a kind, the shapes should be alike.

Third, the color should be proper. Green beans should not show any yellow, nor wax beans any green. Choose each vegetable for the color that is expected of its kind. And again let me say, *likeness* is very necessary. Do not mix colors if possible to avoid it.

Fourth, the matter of grading, which I have emphasized in each of these paragraphs, must be specially considered when the exhibit is arranged. Probably there has had to be variation in the vegetables chosen: there is a largest and a smallest, or a lightest and a darkest, with others between. See now if they cannot be arranged in order. So arranged, the differences in sizes or colors or shapes will scarcely show, while the same exhibit, set out helter-skelter, will seem very irregular.

Fifth, the vegetables should always have a good skin. Scabby potatoes, rusted beans, cabbages which the worms have nibbled, are most unattractive.

Sixth, care should be taken to bring the vegetables to the exhibition in the best possible condition. For this purpose they should be picked late and kept fresh. Rootcrops may be washed when dug, and left untrimmed with their roots in water. Do the washing with a sponge. Leafcrops, on the other hand, may be injured by real *washing*, since they become soggy. They may be kept very well under damp moss. Kept in this way, and carefully protected against sun and dust, at the exhibition hall they may receive a final dressing down. The roots should be trimmed, the tops moistened, and some vegetables, such as squash or watermelon, should be scrubbed.

The final arrangement, whether on the table, on plates, or in baskets, should be careful. I have already spoken of grading in size, shape, and color. Do whatever else you can to make the vegetables appetizing. Make them seem natural

by setting them in greenery, if this is allowed. A sprig of the leaves or flowers of any plant adds to the attractiveness and interest of its fruit.

Rules for flower exhibiting cannot be laid down except in the most general way. The prizes offered are usually for the "best vase of" this or that, or for the "best exhibit of asters, any number of blooms, any arrangement." This leaves the way open for a display of taste, and of this I have already spoken. The gardener who, during the summer, has daily used care in arranging flowers for the house has been training for this exhibition, and already has an advantage in good taste.

If you need rules, these are the best: First, the flowers should be fresh. Second, size is not so important as perfect shape and color. Third, uniformity is not important with a bunch of flowers. They may vary from an opening bud to a flower in full bloom; and to make them seem natural, their stems may be of different lengths. Arranged in vase or bowl or bouquet, they thus recall the garden at its best, and, if not too tightly crowded, will seem to be growing. A little greenery, but not too much, adds to this appearance of naturalness.

There is more than this, of course, to the work of exhibiting, but the best suggestions come from inspiration on the spot. Advantage can be taken of some arrangement of the tables, or of a corner of the hall. A study of the arrangement of vases or plates will often lead to a shift which will make all look better. Spend the last few minutes in thinking, give a few last touches, and then — let the exhibit alone. Too much fussing is often as bad as too little.

Review Questions

1. Give some warning about the picking of vegetables. In what condition should they be brought to the house?
2. What do you do with the unused stalks, leaves, pods, etc.? Why?
3. What advice can you give for the picking of flowers?
4. What is meant by taste in arranging flowers?
5. Give advice for arranging a vase of flowers; a bowl.
6. Give advice for placing flowers in the house.
7. How would you prepare vegetables for market? Flowers?
8. Discuss the grading of vegetables for exhibition.
9. Discuss the exhibiting of flowers.

CHAPTER IV

Going into Winter Quarters

As winter approaches, the gardener must meet it, watching carefully for each of its stages, and changing his work as the seasons change. The stages are three, not considering the work of potting plants for the winter, which I will speak of in another chapter.

First comes the period of light frosts which are yet strong enough to kill the tender plants.[1] The gardener should learn to know when such frosts are expected. The signs are a west or northwest wind, occurring during the afternoon; a clear sky; a chill in the air. If the wind is so brisk as certainly to continue all night, or if the sky is clouded, there will probably be no frost. But often the gardener is deceived as to what the wind or clouds will do. A strong wind will suddenly drop, the clouds will clear away, and at about two o'clock in the morning a biting frost will settle in.

Gardeners who live on hills have one safeguard. Frost is like water, and drains down the sides of hills to settle in the valleys. The hills are therefore likely to escape light frosts.

But whenever the gardener feels afraid that a frost will

[1] Tender annual plants are those which are killed by a light frost. Examples are tomatoes and squashes among vegetables, nasturtiums and cosmos among flowers. The tops of dahlias, gladioli, and potatoes are tender, though their roots are not injured till the ground is frozen. Hardy annual plants are killed only by heavy frosts; examples are cauliflower and sweet peas. See the planting table, and for other classes of plants see page 91.

come, he should protect the tender plants. What is needed is a covering of some sort, to keep out the cold air and keep in the heat of the soil. Hay or straw or cloth will do, either laid on the plants, or held above them on stakes. There is a good deal of bother to all this, especially if it amounts to nothing because the frost does not come; but often the trouble will

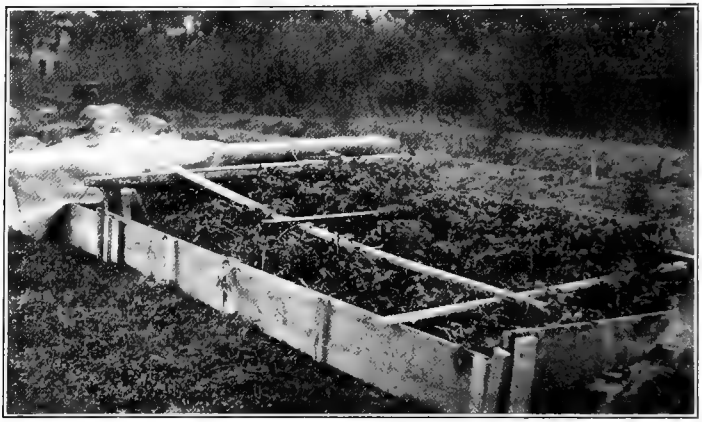

FIG. 16. — THE FIGHT AGAINST FROST.

Such a frame of loose boards held by stakes, with the burlap cover on a roller, is of great use in protecting the tomato plants against frost.

save several days longer, sometimes for weeks, the beans, the nasturtiums, or the salvia.

If there are plants which are to be covered with frames, so as to keep them into the real winter, the frames should be set at the first alarm of frost. Then on every doubtful night, the sash can be put on. The less the plants have to fight the cold, the more vigorous they will be.

At last comes the time when in spite of all care the tender plants have been killed. They should be cleared away at

once, and the soil sowed with rye, the best late cover-crop. Rye is hardy, and in places where the winter comes slowly it will often make a little growth to protect the surface of the soil against the rains of late fall and early spring. When turned under in the spring, it will make good manure.

Of course the dead plants should be thrown on the compost heap, there to rot and make humus for the future.

Dahlias, Jerusalem artichoke, potatoes, carrots, and all tender roots should at this time be dug.

And now begins a second fight against the frost. The endeavor is to prolong the lives of the hardy plants. Of course the gardener will be beaten, but again he can save sometimes for weeks his plants or fruit. The same coverings that were used for the tender plants are used for the hardy ones. One thing the gardener should remember: not to uncover the plants in the morning until the frost has begun to yield to the sun.

Wherever it is too late to plant rye, the gardener should spade the ground. How to do this is described in Chapter XXXIV. The gardener should spade deeply. This will freshen the soil for the spring, so that the "spring fitting" is made easier. It will also rout the insects out of the nests they have made against the winter, and cause them to be killed by the frost. It will let the frost go more deeply into the ground. The spaded ground should be left with a rough surface, to prevent much washing by the rains.

If it is decided to set in the fall such plants as peonies or iris or lily of the valley, it is proper to do so as soon as their leaves are dead. Give them plenty of earth, set them as deep as they were before, pack the earth firmly around them; and when the ground freezes, bed them with manure or leaves to the depth of three or four inches.

This is an excellent chance to prepare next year's garden,

in case a new one is to be started, or the present one enlarged. The gardener will thus avoid the rush of spring work, and, especially if manure is to be dug in, will give the frost a chance to mellow the ground. For the work of planning, see the chapter on that subject. Study now the chapter on Hot-beds and Cold-frames, if they are to be used next spring.

Late September or early October is the time to plant bulbs.[1] They are usually planted in the borders, the edges of the flower beds, and sometimes in the lawn. If planted too early, they will sprout and be injured; if planted too late, they will make no growth; but if planted just about the time when the heavy frosts begin, they will make root growth but no leaves, and will then be ready for an early spring start.

All bulbs should be plump and firm. If you cannot rely on your seedsman, examine the bulbs carefully before buying.

The easiest bulbs for a beginner to use are the snowdrop, crocus, scilla, tulip, narcissus, hyacinth, lilium candidum.[2] All of them may be set in ordinary garden soil; the richer the better if well drained, and if manure is not allowed to touch the bulbs. All bulbs should be planted in groups or rows of the same kind. If you have but few, do not try to make them cover much space; they look better when together. Study the seedsman's catalogue, and get several of every kind you order. "Mixed" bulbs are likely not to harmonize.

Snowdrop may be planted in the grass or borders, or under overhanging shrubs.

Scilla and crocus may be similarly placed, although I do

[1] Bulbs are the leaves and flower-buds of certain plants, all drawn and folded close together for the winter above the thin, flat, coin-shaped stem, and often protected by a husk. In this condition they will keep a long time; when planted, they root and grow. See the next chapter, and the chapter on Bulbs and Tubers.

[2] Madonna lily.

not like them in the lawn. They are likely to interfere with mowing, since if they are to live from year to year, their foliage should not be cut till it is turning yellow.

These three may be allowed to remain where they are set.

Tulips should go in the borders or beds, and if freely planted will make a gorgeous show. The same is true of narcissus, hyacinth, and lilium candidum, though none of these have the glowing colors of the tulip. But tulips should be lifted every summer, while the others remain where planted. The narcissus may be planted in the long grass, where it will make a fine show in spring, and where its foliage will be ripe by haying time.

FIG. 17. — Scilla is one of the earliest spring flowers. Set the bulbs in the fall.

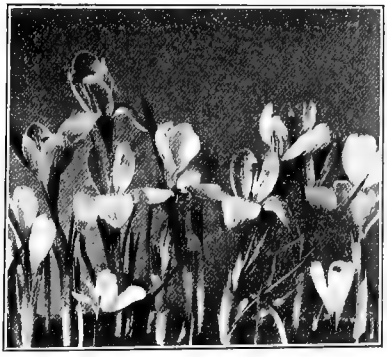

FIG. 18. — Crocus, on account of its spring brightness, should be planted in the fall.

Bulbs set in the grass should be planted as follows: with a trowel or knife lift a flap of the sod, set the bulb in, pointing upward, and press the sod back again.

Or with a dibber make a hole in the sod, set in the bulb, and cover with loam.

Bulbs in the flower beds should be set more carefully, since they should all be at the same depth, so as to bloom together. Let the varying kinds of buds make a change from early to late. Set the bulbs, if the soil is likely to be wet, on a little bed of sand, dropped into the hole. Holes for small bulbs may be made with a dibber, for larger ones with a trowel. Cover them with twice their own depth of earth. Then when winter comes, and when the surface of the ground has frozen solidly, cover the beds with leaves, old manure, or litter, so as to keep the earth from thawing until spring.

FIG. 19. — Tulips come in many forms and colors. Plant now in the borders.

This setting of bulbs is the last planting of the year. It varies with the latitude, beginning in the latitude of New York with early October. With every hundred miles south, it should begin a week later; with every hundred miles north, a week earlier. If, however, the garden is on a mountain side, so that the cold strikes in sooner, the planting will have to be earlier.

And all the time the march of winter continues. We have

reached the season when there will be a frost whether it is cloudy or not, whether there is wind or not. The surface of the ground is frozen every morning, the tops of the beets and parsnips are dead, and even the hardy chrysanthemum yields to the season as its blossoms die. It is time to take every plant from the vegetable garden except the asparagus and rhubarb, sea-kale and udo, the cover-crops, the spring spinach,

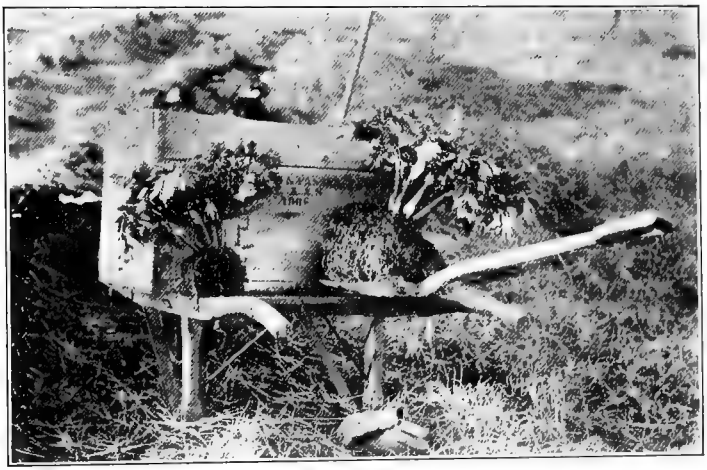

FIG. 20. — These celery plants, lifted as shown on the right, and trimmed as shown on the left, are ready to put in the box and store in a cold cellar.

and the parsnip and salsify roots. The annual flowers must be cleared away, and the compost heap increases with the pile of dead stalks. The celery is covered over with earth and boards and leaves, or is set, roots and all, deep in the ground. The last bare bit of garden is spaded over.

And at last the flower beds, the shrubberies, and the bulbs are to be bedded down. If we let nature alone, she will do some of the work for us. Everywhere through the fall

house-owners are collecting and burning the leaves that fall from the trees, even though these will make the best bedding in the world. Let them lodge in the shrubberies and the gardens; rake up those from the open lawn and add to the heaps. Spread them evenly, so that there shall be no bare spots; and if you have a little manure to throw on the leaves, to hold them down, then they will stay in place all winter, even though the snow does not come until late. Or keep them in place with a little earth. In this way much money, often spent for manure, will be saved. The leaves, once thus bedded, and matted together with the rain, will presently begin to rot; in the spring they may be dug into the ground, and so what so many people wastefully burn becomes good plant food.

Thus the garden has gone into winter quarters. A few plants may be yet yielding in the frames, and all the perennials are but waiting to start into growth in the spring. But the good garden which has been employment and pleasure to us must be left to itself till the winter is gone.

Review Questions

1. What do gardeners fear in the early fall? Tell the signs of its coming. Tell how to protect against it. What plants do you first protect?
2. Why is a hill garden safest?
3. Why do we dig tender roots?
4. Give an account of the second fight against the frost.
5. Why do we spade bare ground in the fall?
6. Why do we now plant certain bulbs? Describe the planting of the different kinds. Which ones have you planted?
7. Tell how and why to cover flower beds.

CHAPTER V

Potting for the Winter

As the frosts approach will come the question of how to save the tender plants which are fit for house blooming. There will be geraniums, balsam, and other plants, either old friends or new ones raised from cuttings, which must be potted before the frosts weaken them. Or there will be such plants as stock, raised from seed during the summer for just this purpose.

Most of these should go into deep pots of the ordinary kind, which should be carefully selected for them. The size of the pot should not be so great as the spread of the leaves is expected to be when once the plant is growing well. But no rule can be given for this, except to say that the pot may easily be too large. The beginner is likely to be over-generous. Having chosen the pot, proceed as follows.

First the plant and its soil should be well watered as deep as the roots go.

Then scrub the pot thoroughly. It should be clean and moist.

Next, the pot should be drained. Put in the bottom broken earthenware, or stones, to the depth of perhaps an inch for a six-inch pot. For smaller pots merely cover the opening, sifting in a little sand or gravel.

The earth used may well be the soil in which the plant is growing. I should prefer, however, to mix some that is rich for the bottom and sides of the pot. For this purpose, mix

with the soil some very well-rotted manure or compost, and put some of it into the pot, above the drainage. Keep the rest at hand.

Now, with a sharp trowel or spade, cut around the plant, making a circle (with the plant in the middle) a little larger than the size of the pot. Lift the plant, with its earth, and with pruning shears cut clean any bruised roots. Rub off the earth from around the plant until you have a lump of soil of the proper size and shape to fit into the pot. If in doing this you expose some roots, no matter. Set the plant in the pot, putting in more earth, if necessary, at the bottom and sides, making sure that there are no air spaces. The top of the earth should be a half inch, or more for a large pot, below the rim.

FIG. 21. — A useful action in potting. Press the earth firmly (but not too firmly) with the thumbs.

In finishing, water the plant to settle it in place, and set it in a shady place. Keep it from the sun for a day or two, and gradually accustom it to the air and temperature of the house.

Besides these plants, grown in the garden, and not to be exposed to frost for a moment, there are other plants, chiefly bulbs, which can be potted after frosts come. These need a good mixture of rich earth, such as equal parts of coarse sand, leaf mold, good loam, and very well-rotted manure — best, a mixture of horse and cow manure. But if you have in the garden some dark and rich, though not wet, soil, mix a quantity with half its bulk of the manure, and that will do

well enough. Save now, and store away from frost for use next winter, some of this mixture; or else save loam, compost, sand, and manure separately.

Pots for bulbs are of a different shape, being usually wider and shallower than for ordinary plants. Scrub them well. Then drain them with a stone or bit of pottery to cover the

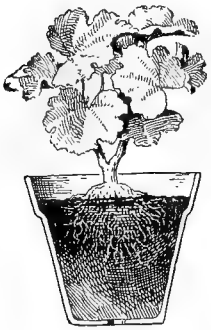

FIG. 22.

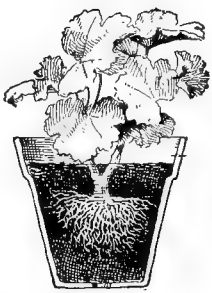

FIG. 23.

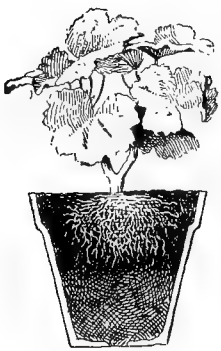

FIG. 24.

FIG. 25.

Potting a geranium. Fig. 22 is too high, Fig. 23 too deep; Fig. 24 has too much earth, Fig. 25 is just right.

hole, and a half inch of sand or gravel. The size of the pot should depend upon the number and size of the bulbs that you are to put in it. It must be at least two inches deeper than the bulbs. The bulbs may be set their own width from each other, though florists often crowd them closer.

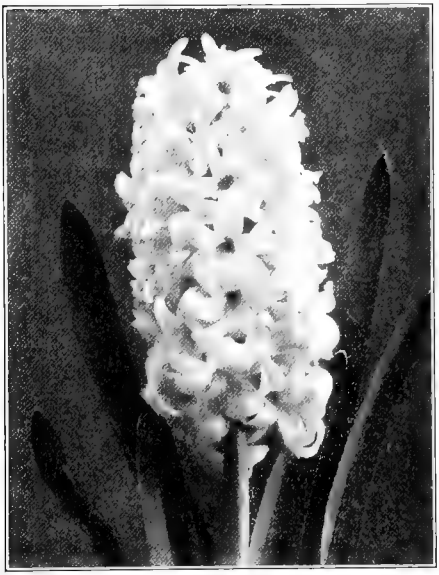

FIG. 26. — Hyacinths are easily grown in pots.

And now, what bulbs to set? They had best be crocus, tulip, hyacinth, narcissus, freesia. Crocus and freesia are small bulbs, and eight or ten may go in a five-inch pot; of the others, three or four. Let me speak of them one by one.

Crocus are small, and are most beautiful in yellow, blue or purple, and white. They are the cheapest.

Of tulips, not the tall parrot or Darwin, but only the short single or double kinds, should be planted in pots. They come in many colors.

Hyacinths come in many forms and many colors. The odor of the hyacinth is strong.

Narcissus includes the jonquils and daffodils in many forms, white or yellow. They are fine for potting.

Freesias are best in white. Their bulbs are small, but produce clusters of fine, fragrant flowers.

In planting any of these, be sure to have them all of the same variety. A mixture of colors or sizes will be unsuccessful.

And, as always with any bulb, seed, or plant, buy of a good seedsman. He carries the best bulbs, which are most worth your money. Better have fewer pots, and good, than more of a poorer kind.

When the work of potting is to be done, lay an inch of earth on the drainage material, and on it set the bulbs, right side up. Now fill in all around them with earth, keeping them carefully in place, and covering them about an inch, or until the earth, firmly packed, is within a half inch of the top of the pot. Water them well and set them aside, *after labeling each one.*

They must now be stored in order to make roots. A cool, dry cellar is a good place to set them in, or any place that is dark, cool, and free from frost. They may even be stored in the ground, if only the frost and mice are kept out. For this purpose dig a two-foot trench in a well-drained spot, where water will not stand around the pots. In the trench set the pots, cover a foot or so with earth, and wait till the surface is frozen. Then cover with straw or leaves for two or three feet more, strewing it well on all sides of the trench, and keeping it in place with boards. The trench should be so placed (as should a celery trench) that you can get at it from one end, so as to get the pots out as you want them.

Wherever you store the pots, leave them for some weeks. Supposing that the potting was done in October, do not begin to take them from storage until early in December. Those which are stored outdoors will take care of themselves. Those stored indoors must be kept watered.

When you decide to use them, you may find an inch or more of pale leaves showing above the earth in the pot. Bring the pots into the house, but into a room not too warm

at first, and set them in a north window, away from the sun. Gradually get them used to the temperature of the house, and move them into the sun. Keep them well watered, and

FIG. 27. — Lily of the valley makes a fine show in the house. Set the pips in "standard" pots.

if you have followed directions well, they will grow fast. You may be able to have Roman hyacinths and paper white narcissus in blossom by Christmas, and can have a series of flowers all winter.

If you are more ambitious, you can add to this list lilium candidum, lily of the valley (best taken from the outdoor bed after the foliage is dead), Easter lily, calla, and gladiolus. Choose pots according to the size of the bulbs, and pot as directed above.

The work of potting and forcing bulbs is interesting and clean, and very well rewarded. Few plants are so wonderful as these, which in so short time make leaves and flowers from the dark bulb.

Review Questions

1. How large a pot should we choose for a house plant?
2. Why do we water deeply before lifting an outdoor plant?
3. How do you drain a pot?
4. Explain the lifting and potting of a plant?
5. Bulb pots are often called pans. Why?
6. Describe the potting of bulbs; the storing of plants.

General Review Questions

1. At what stage in the progress of a people does gardening begin, and why?
2. What is gardening?
3. How does a plant fulfill its purpose?
4. What are the parts of a flower? How do they make seed?
5. When is it wise to save seeds for planting?
6. Explain the work of saving seed.
7. What is the great danger to plants in fall? How may we meet it?
8. Tell how to plant a bulb; how to pot it.
9. Tell how to take up a plant for flowering in the house.
10. Why should we spade the bare garden in fall?
11. When and how should we cover the flower beds?

SECTION II

THE WINTER WORK

CHAPTER VI

Notes and Accounts

There are three questions which every gardener ought at all times to be able to answer. The first is, What have you done in the garden? The second is, What have you learned from it? And the third is, What have you gained or lost by it? To answer the first and second, the beginner should always keep a note-book. To answer the third, he should keep accounts. It is of course true that an account book can never show the pleasure gained from gardening, but at least it will tell how much money has been spent and received.

The note-book is best kept in the form of a record of actions and observations. A diary will not serve very well for this purpose, since on some days there will be little or nothing to set down, while on others the amount to write will overflow almost any page. For the record, in order to be of value, should not be mere jottings. These are never clear to a teacher, nor will they be understood by the gardener himself after a few weeks. The record should therefore be in complete sentences, and should tell enough to make clear what has been done, and seen, and concluded. No pupil should complain if the teacher insists that this much shall be written. Some pupils will naturally write still more. So an

ordinary blank book, of convenient size, should be used for a note-book. If it is intended to take the book into the garden, a medium hard pencil, which will not smooch, will be better for writing than ink, which will blot or run. The pencil, especially if it is provided with an eraser, is better for making diagrams and sketches.

It is not intended that the note-book shall contain what is already printed in the text-book, unless the teacher desires. But the winter's work begins with a number of experiments, each one of which should be carefully recorded. What the experiments prove should also be written. Sketches of apparatus or of seeds or plants will help to make these records clear. Later in the year, when each pupil is working with his own plants indoors, or in his outdoor garden, he should note the date and amount of everything he does, his spading, planting, cultivating, and so forth. With this he should give notes of the weather, whether each day is sunny, cloudy, or rainy, and also of the season, whether early or late, wet or dry.

These are mostly mere facts, but the gardener should also write down conclusions drawn from facts. His mistakes and his successes, with the things which he has found out for himself, will do as much as anything else to make the note-book worth his while.

And that it should be worth re-reading, the writing should be well done. I do not mean merely that the pages should be neat and the writing clear, though these are important. More important is it that his ideas should not be jumbled, but should be in good order and expressed in good English. A few extra minutes spent on this will double the value of the note-book.

This record, so made, will bring the student from the beginning to the end of the garden year. Whenever a record is made, the date should be set down. But besides this

there should be a page or two devoted to separate subjects.

First there should be a garden plan, or at least a sketch of it. As we shall see, the working plan of a big garden had best be much larger than the page of a note-book will allow; but a sketch kept in the book, preferably on two pages that face each other, will be very useful. And if the garden is small, the note-book plan will be all that is needed.

There should also be a page given to the amount of seed, bulbs, and plants bought, in order to know just what kinds they were, and from whom they came. Beside each entry there should be left a space for recording whether the seed was good or bad. Studied in the next year, this page will give valuable hints as to the kind of seed to buy or avoid, and whether the dealer is trustworthy.

I like to keep in my note-book a page for recording first pickings of the different vegetables and flowers. This, when compared with other years, will show whether the asparagus came earlier, whether the tomatoes were brought along as fast as they ought to have been, and whether the asters were early or late.

If the gardener feels so sure of his taste for gardening that he knows that he will keep a garden year after year, he will find much interest in keeping still another note-book, which this time should be a diary of the kind known as a "line-a-day book." This gives on each page a single day of the year, marked off in five spaces, each representing a year. Thus each page allows the record of a given day for five succeeding years. The record should always be brief, quite different from the school note-book. It may contain a statement of the work done each day, the pickings, and the weather. Occasionally should be put in a statement of the general condition of the garden, usually telling whether the season is favorable.

Comparison over a number of years is thus possible, and is very interesting. But such a diary must not be expected to take the place of the school note-book.

In the school note-book, or in a separate one, should be kept the accounts. These are plainly necessary if the garden is a "commercial" one; that is, if its products are to be sold. Accounts are also evidently worth while for a vegetable gardener who supplies his family without selling anything to others. But even a flower gardener, whose chief gain is in pleasure, ought to keep accounts in order to know the cost of the work and to see where it can be lessened. A study of the accounts at the end of the year, or even from month to month, will show leakages and little extravagances which can be stopped.

The accounts should be properly kept on pages ruled for the purpose. Most important are the journal or day-book pages, on which, on the right-hand page or column, is set down each item of expense. The cost of seed, bulbs, and plants (and here also the amounts and dealer should be set down), of tools, fertilizer, and manure, and also of hired labor, naturally occur to any one as proper to put in the account book. But an important item should not be forgotten: the gardener's own labor. It has its value per hour as well as has paid labor. Early, therefore, the boy or girl should calculate what that value is. It may be that the value has already been set in a town by the customary wages of strawberry-pickers, or that a certain amount per hour is known as proper pay for weeding or "choring" wages. In such a case the gardener can be sure how much he can charge for his time. But if there is no such town wage-scale for a boy or girl, there is surely one for a man. So many cents per hour is paid for skilled labor, and somewhat less for unskilled. The garden beginner is of course unskilled, and

ought therefore to get no more than half of what a day-laborer would. If he is rather small and weak, and does not work steadily, he ought to get no more than a third. But the older and stronger he is, the more he knows, and the more steadily he works, then the more nearly be becomes a skilled gardener himself.

I should suggest that parents or the teacher should be asked to help settle how much the gardener shall charge for his time. When this is decided, then the gardener should keep an account of the number of hours worked, and set it down each day.

All this is on the debit side (the cost or expense side) of the account. On the credit side (the receipt side) should be set down all money received from the sale of vegetables or fruit. In the average garden this amount will be small enough. But the home vegetable gardener is nevertheless doing a valuable service in feeding his family. An occasional inquiry at the provision dealer's will inform him of the market price which he can charge for his beans and corn and lettuce. The amount proper for each mess of vegetables can then easily be calculated and set down in the book. Even if no cash is received for these services, the gardener may be proud of doing something toward "earning his keep." And a girl who keeps the house supplied with flowers may likewise, though with more difficulty, get an idea of the value of her work in keeping the home beautiful.

Each month, or if that is not possible, at the end of the year, the various items should be posted in a ledger account. The various headings of expense will come under the gardener's labor, hired labor (which ought to be only in spring, for the fitting of a large garden), seeds (including bulbs, etc.), manure (including chemicals), and tools (including baskets, labels, string, and all such articles used in the work of garden-

ing). Only thus can one really see where the money has gone, and decide whether too much has been spent under any one heading. The headings of receipts should also be classified.

This is the usual method of book-keeping. But recently a simpler method has been used by bookkeepers, and the state of Massachusetts, in one of its bulletins, recommends its application to farm accounts. By this system are used pages with many parallel columns. Each item, of money received or money spent, is entered immediately twice on the same page, once in a general column of receipts or expenses, once in the particular column in which it belongs. Thus fifty cents spent for a hoe will be entered first in the column with all other money spent, and second in the column for tools. By this method the ledger is posted daily, time is saved, and all accounts are in the same book.

Careful study of the ledger account should readily show whether proper economy has been used, or whether in another year the gardener should be more careful. The proper way in which to account for tools, fencing, long-lived plants such as shrubs or peonies, anything which is permanent or nearly so, is to start a separate account, called the Equipment Account. In this the first cost is charged, while in the yearly account should be charged only a fraction of it. It is fair, I think, to expect a tool or a shrub to last for ten years, and therefore to charge in each year's account a tenth of the cost. Thus the cost is distributed, and thus the profits or the loss do not appear too large. If the tool breaks, or the plant dies, before the ten years are up, it seems fair to conclude that poor goods were bought, or that proper care was not taken, and to remember the lesson.

It may be objected that account books ruled with so many columns are not always to be found. Let any one, then, rule

			General (Day-book)	Annual Seeds and Plants		Fertilizer	Labor		Equipment (Tools and long-lived Plants)	
				Flowers	Vegetables		My Own	Hired	Yearly (10 %)	Total
Jan.	*20*	*J. P Warren, frame and sash*	6 00						*60*	6 00
Feb.	*27*	*Wood's Stable — 2 loads manure*	*3 00*			*3 00*				
Feb.		*Hauling and spreading same*	*75*					*75*		
Mar.	*1–4*	*Starting hot-bed, 3 hr. @ 10¢*	*30*				*30*			
Mar.	*1*	*J. M. Thorburn Co., seeds*	*4 20*	*2 30*	*1 90*					
Mar.	*6*	*Seeding hot-bed, 2½ hr.*	*25*				*25*			
Mar.	*9*	*Ames Plow Co., general tools*	*2 67*						*27*	*2 67*
Apr.	*1*	*10 lb. Nitrate soda*	*55*			*55*				
		1 bag top-dressing	*2 00*			*2 00*				
		1 bag potato-fertilizer	*1 85*			*1 85*				
Apr.	*15*	*Aster and pepper plants*	*50*	*25*	*25*					
	14	*Shrubs from N. E. Nursery*	*1 95*						*20*	*1 95*
		Iris roots and gladioli	*1 28*						*13*	*1 28*
	15	*Spading garden, Pat and I, each 4 hr.*	*1 20*				*40*	*80*		

FIG. 28. — A DEBIT PAGE OF A MODERN GARDEN ACCOUNT BOOK.

An account-book ruled as above allows day-book (first column), ledger (the next six columns), and Equipment Account, all on the same page. A study of this account will show how the various items classify. The labor account is purposely too small; there will be daily entries. See text for ways of managing such an account.

a blank book as in Figure 28. Eight columns on the debit page will give room for very thorough work.

Or an account book ruled with six columns may be used as follows. The credit side will need but four columns of receipts: general, amount from sales, amount used in the house, and the source (money earned in other ways, or perhaps personal allowance) from which the money comes to maintain a pleasure garden. In the remaining two columns of the credit page, after a heavy dividing line has been drawn, may be put two of the debit accounts. These, with the other six on the debit page, make the necessary eight.

A little study of Figure 28 will show how expenses may be charged. They may in other ways be made short and simple. If the items of the gardener's daily labor take too much space they may be jotted down in the note-book and entered on the accounts weekly or monthly. Hired labor may simply be entered when paid for. The amounts of seed may be kept on a separate page, and only the monthly total put in the account.

Thus gardening is not all work with plants. Properly considered, gardening includes the writing of notes and the keeping of accounts. This work is a valuable training in itself, is a guide for future work, and a warning against mistakes, and when it is done is an interesting record to look back upon.

Review Questions

1. Why should a garden student keep a note-book? What plans and records should be kept in it? Are sketches of any value? What should not be put in the note-book? Why should the student take pains to use good English?
2. Why should entries be dated?
3. What is a line-a-day book? Of what use is it to a gardener?
4. Why should the gardener keep garden accounts?

5. Calculate the value of your labor per hour.

6. Explain the difference between day-book and ledger accounts. The value of each.

7. Show how modern bookkeeping combines these on the same pages. Does this lessen work?

CHAPTER VII

A Seed and its Growth

We have already seen how a seed is made, but have not yet studied what it is. For this purpose, let us examine some of the commonest seeds, those of bean, pea, and corn, all of them large enough to show their parts. It is well to have, besides the dry seeds, some that have been soaked for two or three days, or at least overnight.

Let us first notice the difference between the dry and the soaked seeds. The dry seed is wrinkled and very hard. In this condition it can remain for a long time. Handling does not injure it, and it resists mold. So long as it is kept from moisture it will live for several years, although of course it gradually grows weaker. But when it is moistened it swells. Its hollows fill, and it is ready to sprout.

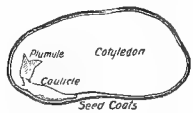

Fig. 29. — The parts of a bean.

A soaked bean will most readily show the parts of a seed. One can easily remove the skin which surrounds it, and which protected it from injury when dry. The skin has served its purpose.

The two parts which are now revealed can easily be separated. They are the largest part of the bean, two plump leaves, called cotyledons.

Where they joined, and now clinging to one of them, is the most important part of the seed. It looks, at first sight, somewhat like a little white worm, until a closer look

shows it to have two tiny leaves at one end. Any one who has examined a peanut remembers the two similar leaves, very small and wrinkled. These leaves are called the plumule, or little plume; while the other end, round and worm-like, is called the caulicle, or little stem. The plumule is to form the first leaves of the plant, the caulicle both the stem and the root.

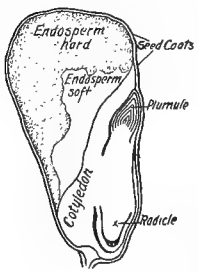

FIG. 30. — The parts of a kernel of corn.

Examination of the pea shows the same parts. There are the plump cotyledons, the plumule, and the caulicle.

The corn seed is different. In the first place, we cannot find two cotyledons, and as we look we discover that the two sides of the seed differ from each other. If we scratch or cut with a knife at the unsoaked seed, we find that one side, which is of an amber color and which lets the light through, is very hard. But on the other side, embedded in this hard mass, is a part through which the light does not pass. If we cut into it, we find that it is soft; and as we cut it lengthwise, we come upon the plumule and the caulicle (often called radicle), pointing away from each other.

We decide that the corn is different from the other seeds, because it has but one cotyledon. It represents, however, a large class of plants, such as the grasses, lilies, and palms, whose seeds have the same structure.

If the soaked seeds have got to the point of sprouting, all these parts may readily be seen. The caulicle thrusts out, the cotyledons separate, the plumule pushes upward. Placed in earth, the seed speedily becomes a plant. But first, what is necessary for successful sprouting, or, as it is called, germination?

In the first place the seeds need moisture. The more

thoroughly moisture is applied, the quicker will the seeds germinate. Without moisture, as the dry seeds have shown us, seeds will not sprout at all. But an interesting experiment will show how different amounts of moisture affect seeds. Looking forward to the work in the garden, get some moist, coarse sand, or else some very sandy loam; the object is to have material which will not pack naturally by its own weight. Put some in the first tumbler, drop in a couple of unsoaked beans, and cover them lightly. Do the same in the second tumbler, but press the material firmly around the seeds. Then cover the tumblers, to prevent drying out, and wait. When you have found which seeds sprout the quickest, you will understand why the gardener walks on the line of seeds that he has just planted, and why the farmer drags a heavy roller over the grass that he has just sown. Then see if you can state all this clearly in your note-book.

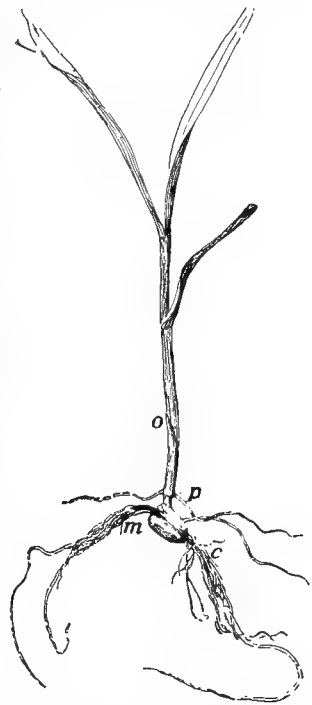

FIG. 31. — A young plant of corn. *c* and *m* show the roots, *o* the stem, and *p* the extra roots which this plant throws out at the surface, for strength.

A second need of sprouting seed is air. If we wish to try this as if in the garden, we can put some seeds into sand or loam, and then others into clay. Pack both of the tumblers tightly, and keep them

pretty moist. The clay will, of course, keep air away from the seeds much better than the sand or loam can. If seeds sprout slowly in the clay, which do you think the gardener would call an "early" soil, a sandy or a clayey loam? Write the answer, with your reasons, in the notebook.

A third help in germination is warmth. If these experiments have so far been carried on in a heated building which is not allowed to become very cold at night, the seeds have doubtless sprouted well. But let us now take four tumblers, and in each plant seeds in moist loam or sand, packing it rather firmly, and then covering to prevent drying. Now put one of these tumblers in the schoolroom, another in the coldest part of the cellar, another near the furnace, or on a radiator, and the fourth in the ice-chest at home, or wherever it can be kept very cold without freezing. Note down the number of days before the different tumblers show sprouting plants. Does the one in the ice-chest sprout at all? It is easy to conclude, of course, that the greater the warmth, the quicker seeds will sprout. But apply this to a shady and a sunny garden: which is the earlier? And which is the better, a northern slope, where the sun falls slanting, or a southern one, where the rays strike straight?

It is interesting, again, to put in a rather cool place, such as the cellar, tumblers containing seed of radish and corn. Put others in the schoolroom; and note down how quickly the seeds sprout. Is the radish so much troubled by the coolness of the cellar as is the corn? You can try this experiment with many seeds, and will find that some of them, such as radish, lettuce, cabbage, clover, beets, or spinach, will sprout in the cellar much more readily than will corn, cucumber, or any squash, beans, eggplant, okra, or tomato. Can you conclude from this that some seeds are

hardier (that is, able to sprout in cooler weather) than others? Which will the gardener plant earliest in the spring?

Do not throw away all the plants sprouted in these experiments. Some of them will be of use in later ones.

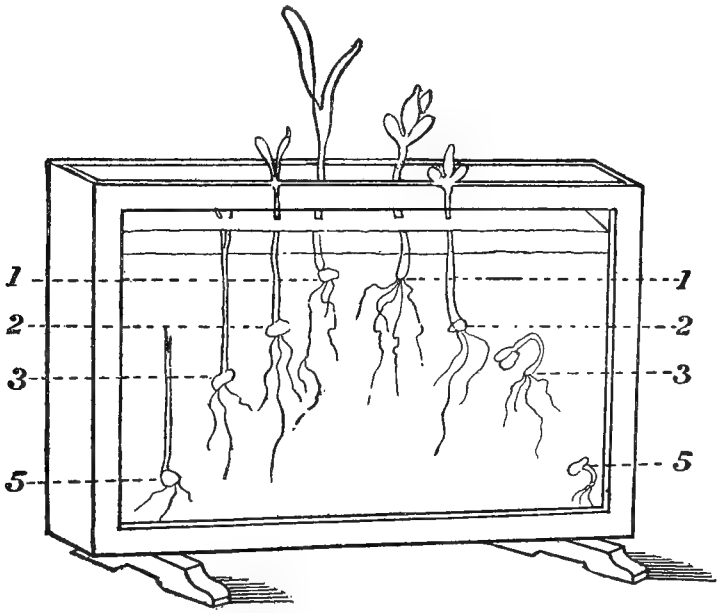

FIG. 32. — Seedlings of corn and beans climbing to the surface from the depths of one, two, three, and five inches. Which depth is best?

A good thing to know is the proper depth at which to plant seed. To begin with, let us see whether there is any advantage in one depth over another. Take any wide-mouthed bottle, and put in an inch of wet sand or loam. Then put in a seed of corn close to the glass, and put in a half inch more of the sand or loam. Set in another seed, touching the glass,

but to one side of the first. Thus at different depths plant a dozen seed, which will be set spirally around the bottle. Now cover from the light, and leave in a warm place. When the seeds sprout, watch to see which of them is best able to make a strong plant.

This experiment will be more successful if it can be carried on in a box with one glass side. If each sprouting plant is given free room at the top, the whole can be more easily studied.

FIG. 33. — Seedlings of bean, with their cotyledons.

We can make sure, as we study the growth of these plants, that it is easily possible to plant too deep, and that a long struggle to reach the surface will weaken a plant. But are the best depths the same for all plants?

This can be answered by repeating the experiment with different seeds, best with corn, peas (not beans), lettuce, and radish, putting one of each at a half inch, an inch, and two inches below the surface. We shall discover two things: First, the smaller the seed, the less able is it to climb from a depth, and the weaker is the plant when it has succeeded. Second, those with large cotyledons have the better chance when deep planted. And this leads us to a new study.

What are the cotyledons for? Let us study this from a couple of the beans which we have kept from an earlier experiment, and which are growing either in the same tumbler or in separate ones. Their large cotyledons show just below the leaves. The younger the plants are, the better for the experiment. Carefully cut away the cotyledons from one plant, but leave the other untouched. If you have three plants, take a single cotyledon from the third. Then keep the plants watered exactly alike, and watch to see

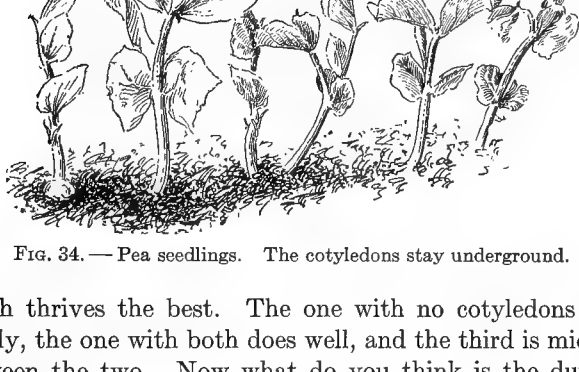

FIG. 34. — Pea seedlings. The cotyledons stay underground.

which thrives the best. The one with no cotyledons does poorly, the one with both does well, and the third is midway between the two. Now what do you think is the duty of the cotyledons?

It ought to be plain, then, that in the last experiment with deeply planted seed the corn and peas did better than the radish and tomato, not only because they were larger, but also because they got much greater help from their cotyledons. The seed-leaves of the others were too small to do any such service.

The experiment would not have come out quite so well if beans had been used. We have probably already noticed

that the bean has first to get its stem out of the ground, and then to drag its heavy cotyledons after it. At the depth of an inch or two this is not a hard task for so large a seed as the bean, but to drag the cotyledons up for three inches is pretty severe. On the other hand, it is easy for the pea and corn, whose cotyledons stay below, to send up the pointed plumule to the surface. But even these can be planted too deep. The general plan is to plant a seed, out of doors, not deeper than three or four times its own thickness. When it is desired to get the roots deep down, as is good for peas, the best way is to plant the seed in trenches, and to fill these as the plants grow. For most other seed the average depth, as just given, is enough.

And we now understand what the seeds do in order to become plants.

Review Questions

1. Should stored seeds be allowed to get moist? Why?
2. Name the two large parts of a bean. What are they for? What is found between them?
3. How does a kernel of corn differ from a bean? In what way is it the same?
4. Name the three needs of sprouting seeds.
5. Is it possible to plant a seed too deep? How do you prove this? Name the general depth for planting.

CHAPTER VIII

The Testing of Seed

As seed grows old it loses its strength, and finally reaches the point at which it can no longer sprout. Various kinds of seed are different in this matter, seed of cucumber often being good for ten years, while seed of foxglove ought to be planted almost as soon as it is dry. Since seed so easily spoils, it is wise to test it when bought, in order to make sure that it is living. If we find that it is dead, we can at once buy other seed, and thus make sure of a good crop.

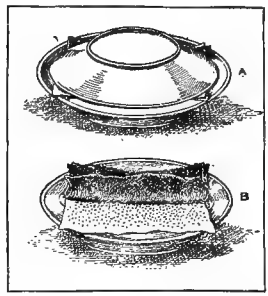

Fig. 35. — The simplest form of seed tester: two plates, with cloth or blotters.

A simple seed tester is easily made out of a plate, a sheet of glass large enough to cover it, and two pieces of cloth or blotting paper. The cloth or the blotters are wet, and placed on the plate with seed between them. Over them is set the glass, to prevent drying out. Or another plate may be used, turned upside down. The tester is kept in a warm place, and occasionally the cloth is moistened afresh, until the seeds sprout. Then by counting it is easy to find out whether the rest of the seed, as a whole, is good or not.

This ought to be calculated as a percentage. Twenty-five is a good number of seeds to test for an ordinary garden

planting, though if only a small quantity, say a penny packet, has been bought, ten seeds will be better. If out of the twenty-five twenty are good, then eighty per cent of the seed are good. If out of the ten there are nine which are good, then ninety per cent of the packet will sprout. Eighty, and indeed ninety, per cent of the seed ought to be good, and if the percentage is less than seventy, then the seed as a whole is not satisfactory. If the percentage is low, as tested more than once, then complaint ought to be made to the seller of the seed.

A farm boy may use this method to test the oats or grass or wheat which is to be planted in the spring, but on account of the great quantity of seed used, he should test more seed, a hundred at least. If repeated tests show a low percentage of live seed, the seedsman ought to provide a new supply.

Of course the seedsman may complain that the test was not fair. In such a case the matter can be settled by sending a sample to the state agricultural experiment station, where it will be tested free, or for a small fee. At any rate, if a boy has been able to show that the seed is suspicious, and the station proves that it is bad, then his simple tester has done well.

There is a kind of seed testing which is becoming widely popular, and that for the best of reasons. Not long ago it was discovered that in the average corn field many hills did not have the proper number of plants, and many plants were bearing poorly. Frequently a field produced only sixty per cent of what it should have done with the same labor. This meant much waste, and the whole loss was due to poor seed.

Now much of the seed was grown by the farmers themselves. It was stored, not shelled but on the ear. When it was thus kept, it was easy to discover which ears were good, and which

were not. And since but twelve good ears are needed to seed an acre, it was not difficult to choose enough ears to plant a good many acres. The method is as follows.

The ears are all numbered and set carefully in order on shelves or the attic floor. From each ear are taken six kernels, beginning at the butt and going spirally around the ear to the tip. This is because one end or one side of

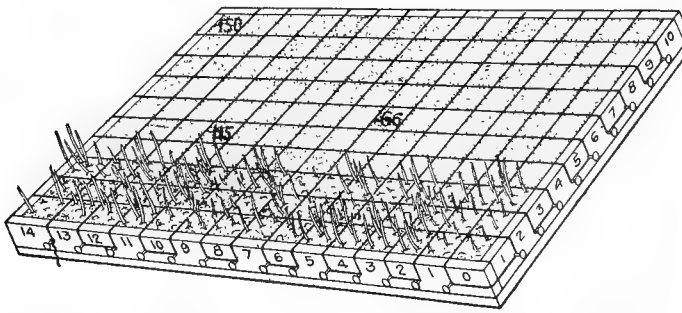

FIG. 36. — A SAND-BOX CORN-TESTER, SEVEN DAYS AFTER PLANTING.
Five kernels were planted in each of 42 squares. Which show perfect ears? Was the seed well grown, or well kept?

the ear may be bad. Then, keeping each set of six kernels separate, they are all tested.

But if one is testing a hundred ears or more, it is very clumsy to do the work with dinner plates. Other methods have been devised. I will speak of the three best.

The first is the sand-box tester. Make, out of a soap box, a tray an inch and a half deep. Fill it with moist sand level with the top. On the sides, an inch and a half apart, drive tacks. From these tacks lace twine back and forth across the tray, going both ways, so that the sand is marked off into squares of an inch and a half. It is most convenient if there are ten squares to one side of the box, so that the

number of any square may easily be calculated. Thus the fourth square in the fifth row will be number fifty-four, the seventh square in the sixth row will be number sixty-seven, and so forth. Of course the squares may be larger than an inch and a half, but it is not convenient to have them much smaller.

Now in each square are planted the six kernels from the ear which bears the same number. This can be done by two students working together, one taking the kernels from each ear by using a dull knife applied to the *edge* of the kernel, the other planting the kernels. When they are all planted, the top of the sand is made smooth and firm, and the box set in a warm place. To prevent drying out, it may be covered, or from time to time it may be watered. Watering is done by a watering pot with a fine sprinkler, or by pouring the water on a cloth or piece of paper laid on the middle of the tray. The seed must not be washed out.

This kind of tester is very good for showing almost at a glance the result of the test. Some squares will presently have six points of green, some fewer, some none.

Another good tester, but not so interesting, is the sawdust box. This should be about three inches deep. Into the bottom is put an inch of wet sawdust. On a piece of cloth larger than the box is marked the size of the inside of the box, laid out in squares, the squares numbered. This can be done with pencil. The cloth is then laid on the sawdust, and tacked to the box by the edges. On each square are laid the kernels from the proper ear. Finally these are covered by a bag of sawdust, made into a pad an inch thick. This is kept moist, and after the fourth day the box is examined daily. In lifting the pad, the kernels must not be moved from their places.

The easiest tester to make, smallest, and lightest, is the

rag-doll tester. This is made of a strip of cloth eight inches wide and as long as necessary. If it is to be used often, the edges should be hemmed to prevent raveling. Down the middle draw a line, and draw lines across this every two or three inches. Number these divisions, and in them lay the kernels from the numbered ears, after the cloth has been wet. Then, using a small round stick, to make the work easier, and to keep the kernels evenly wet, roll up the cloth from one end, and keep it tight by string or rubber bands. Now soak the roll in water for two hours or more, and then set it under the pail in which it has been soaked.

All these testers should be kept warm (not less than 50°) by night as well as by day.

The testers will give the same results from a test of corn, and are quite as good as any of the expensive ones which may be bought. The results should be studied with a little care. Kernels which sprout badly or not at all, or which when sprouted do not promise to give strong plants, show that the ears from which they came should not be used in planting. Those which sprout actively show the ears which may be used.

The custom of testing corn is one of the wisest, and will sometimes nearly double the crop. One thing it has proved. Corn should be stored, or bought, not shelled, but always on the ear. Then it can be tested.

The record of a corn or other seed test should be carefully kept in the note-book.

But the germination, or sprouting test, is not the only way of testing seed. Seed is often adulterated. This is not possible with the seed of corn, or beans, or any other large and peculiarly shaped seed, unless seed of another variety of the same kind is mixed with it. This might be done, and could not be detected until the crop is harvested.

But it is possible to mix with small seed, such as that of clover, other small seeds of a different plant, which look so much like the clover seed as not to be distinguished except under the magnifying glass. Chaff, sand, and other impurities are also sometimes mixed with small seed. The buyer ought to know how to tell if his seed has been adulterated.

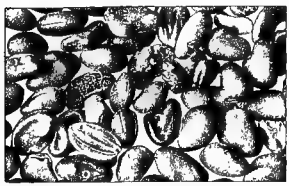

FIG. 37.

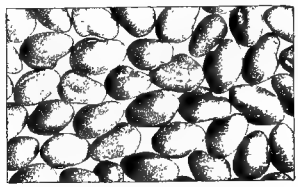

FIG. 38.

Fig. 37 shows "cheap" clover seed, containing many weeds.
Fig. 38 shows "expensive" clover seed, with no weeds at all. Which is really cheap?

The best practice for a student is to buy samples of seed of different grades, cheap as well as expensive, and then examine each for the amount of pure seed.

For this work will be needed a common hand magnifying glass, such as can be cheaply got in many forms. Then take from the seed (alfalfa, clover, or one of the grasses) one or two ounces according to the size of the seed, and very carefully examine it under the glass, moving the seeds with the point of a pencil or a knife. A very little examination will allow us to separate the sample into three parts. One will be pure seed. One will be seed of other kinds. One will be waste matter, sand, broken seed, or dirt.

But we cannot separate the pure seed from the weeds unless we know what the pure seed looks like. This we can find out by study of Farmers' Bulletin 382 ("The Adulteration of Forage Plant Seeds") which can be got free by applying

to the Editor and Chief of the Division of Publications, Department of Agriculture, Washington, D.C. Its many illustrations show both the pure seed and its adulterants, which are chiefly weed seeds that cause much trouble.

When we have thus separated the sample, we can estimate its value. This can be done roughly, by guessing at the amount in the three piles. Or it can be done accurately, by weighing. The scales should be delicate; yet if the student does not own or care to buy a set, he can, if he is clever with his hands, make one himself by studying Exercise 12 in Farmers' Bulletin 408.

The combination of the germination test with the purity test of seed is very valuable. After one has separated out the pure clover seed from the sample, he may find that many of the seeds are small, dull in color, or shriveled. Let him count out a hundred of the seed, taking them just as they happen to come, and test them for sprouting.

From the figures that these various tests give him, he can make very valuable records. For each test the student should put in his note-book first the weight of the sample, then the weights of pure seed, weed seed, and waste matter. Next he can calculate the percentage of pure seed, by dividing its weight by the weight of the sample, and multiplying by one hundred. He has already been shown how to find the percentage of germination of the seeds tested. But most important of all is the percentage of good seed in the whole sample. This is found by multiplying the two percentages already found, and dividing by one hundred. Thus if in a sample there is but seventy per cent of pure seed, and if eighty per cent of that germinates, then in the whole sample there is but fifty-six per cent of pure seed.

A few tests of this kind will show which is really cheap seed and which is not. Seed which costs less may often be

so much poorer than an expensive seed that it ought not to be planted. Only good seed is worth planting: "The best is the cheapest."

We must not always conclude that seed is bad because of some one's dishonesty. Uncleanness, the mixture of weed seeds, or even bad germination, may come only from carelessness. The seed may have been hastily or ignorantly harvested; it may not have been properly cleaned; and it may have been badly stored. Seed which has been moistened, or which has suffered from changing temperature, will not sprout well. That is why the old-fashioned corn-crib is not so good for the storage of seed as is a dry and not too cold store-room. And we may conclude that to be sure of good seed we must either handle it well ourselves, or buy it from dealers who take pains with the harvesting, the cleaning, and the storing of their seed.

Review Questions

1. Why do we need to test seed?
2. Describe a simple form of tester.
3. Why is it wise to test the seed of corn?
4. Describe the sand-box tester. The sawdust-box tester. The rag-doll tester.
5. Why should we test seed for impurity? What do we need for the work?
6. Why is cheap seed costly?

CHAPTER IX

The Life of a Plant

The study of the sprouting of a seed has shown us the three parts of any plant: root, stem, and leaves. These, in a young and healthy plant, grow rapidly, but the regions of growth are interesting to study, especially on the root and stem. We can do this by means of experiments.

Take first any well-sprouted seed which has a root nearly an inch long. Beans are best for this purpose, since the roots are so plump. On a root make ink marks at regular distances, say an eighth of an inch, and place a mark at the very tip. This must be done very carefully, with a fine brush or a very wet pen, taking pains not to injure the root. Let the ink dry, and then put the seed between pieces of damp blotting paper, taking care not to have it too wet, lest the ink markings run. At the end of a day examine the root, and add to the markings if necessary. A second day's examination will show very clearly that the root grows chiefly at the tip.

Stem and root can be studied in comparison with a plant which has further grown, and which, being perhaps a fortnight old, has both stem and root. Using fine and soft thread, and taking care not to injure the plant, mark off on stem and root regular spaces with knots. Or use ink as before. Then set the roots between pieces of wet blotting paper, leaving the stem in the air. As the plant grows it can be regularly examined. It will be seen that both root and stem grow chiefly at the tip.

Why have we been watering the plants that we have studied, by keeping the sand in the testers, or the blotting paper, moist? It is, of course, because we believe that the plant needs the water. Now it is interesting to try to prove this.

Take one of the pots which we have previously used for sprouting seeds, choosing one which has one or two strong plants.[1] Take another which has no plants, but has about the same amount of soil. Cover them with cardboard in such a manner as to prevent evaporation. The cardboard for the pot containing the plants will have to be slit for each plant, and the slits sealed again with wax. Keep both pots in the light, so that the plants will thrive. Each pot should be set in a tin can. An inch above the bottom of each pot make a dent on the can, and fill the can with water up to the dent. Every day refill the cans to the same marks, keeping a record of the amount of water poured into each can. A few days will show a difference in the amounts of water used: the plant uses much; the other pot, after the first day (when the earth naturally took up a good deal of water), almost none at all.

We can make either of these experiments very sure, if we wish, by keeping the water from the pots or tumblers for a couple of days. The plants will wilt. But if water is given again, they will recover.

A plant, then, keeps itself alive by taking water from the earth around its roots. How does it take up the water, and where does the water go?

To answer the first question we need first to examine again the roots of a plant, preferably a radish. The roots of even the very youngest radish are bristling with tiny hairs, easily seen without a glass. With other plants we may have

[1] At the time this experiment is begun, a few radish seeds should be started in another tumbler, or pot.

to use a magnifier in order to see these root-hairs. They are the parts which do the work of drinking in the water.

But if we suppose they have mouths for this drinking, we are mistaken. Their walls may be very thin, but they have no openings. How can water go through the root-skin, or membrane?

FIG. 39. — The root-hairs of a radish seedling. Through them the plant feeds.

Let us first understand what is meant by a solution. It is water in which something has been dissolved. Stir salt in water, and we have a solution of salt. Touch the tongue to it, and we taste the salt. It is by dissolving the salt that we taste it, for if we should put dry salt on a perfectly dry tongue we could not taste it.

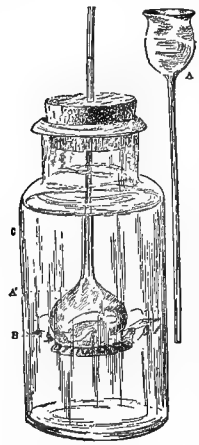

FIG. 40. — A TEST FOR OSMOSIS.

A is the thistle-tube, *B* the membrane, *A'* the heavier solution, *C* the lighter one.

Second, some solutions are thicker, or heavier, or denser than others. Salt and water is heavier than water alone, and white of egg is heavier still. If we keep on adding salt to our solution until the water can dissolve no more, the solution has become very heavy, and is called saturated. Now let us see how this affects plants.

Take what is called a thistle-tube, and over its large end tie a membrane of some kind. A piece of bladder is usually to be had for this purpose. Take also a wide-mouthed jar partly filled with

water. Partly fill the thistle-tube with our strong solution of salt, and put it, large end down, in the bottle, so that the top of the salt solution stands at the top of the water. In a couple of hours the salt solution will be seen to be rising above the water, and after a while it will even be pushed out of the top of the tube.

If we use molasses instead of salt, the contrast of colors will show the result plainly.

This seems to show that a lighter liquid will force its way into a heavier liquid, even passing through a membrane first. This is called osmosis. To partly test this, though without a membrane that we can see, let us take some fresh slices of potato,[1] drop some of them into water, and some into our salt solution. At the end of an hour take them out. Those taken from water will be stiff and crisp, those from the salt will be soft and wilted. The water has passed into the potato, where the sap is heavier still. But the sap has passed from the other slices into the heavy solution of salt.

Now we can see clearly enough how water passes from the soil, through the skin of the roots, into the plant. As we shall presently show, soil water has substances dissolved in it. Once in the plant, what does the soil water do?

We can test this by dropping into a tumbler half full of water, a spoonful of red ink. Into this put any white flower, which should be fresh, with its stem freshly cut. It should best be cut with a sharp knife, so as not to bruise the fibers. On watching, we shall see the red water slowly pass up into the flower, until it has entirely colored it. By such simple means we can easily make what cannot grow in the garden, a blue rose. We can try the same experiment with a tender leaf, and can fill it with red or blue sap.

The soil water therefore passes upward from the roots to

[1] The membranes here are the walls of the invisible cells.

the top of a plant. This can be proved differently by getting a short glass tube, and a plant, say a geranium, whose stem is about the same size. Cut the plant off near the ground, and bind the tube to the stem with a strip of plaster. Sap, forced out by the pressure from the roots, will gather in the tube.

But why should the soil water pass upward? To understand this, let us think once more about denser and lighter solutions. We have seen that we can make a solution denser and denser by adding salt. But of course the same result can be obtained, from the same solution, by taking away water. If we simmer it on the stove, the water will pass off (we call it evaporating) and the solution will taste saltier and saltier.

FIG. 41. — A means of measuring the amount of water evaporated by a plant's leaves, when watered through the thistle-tube.

Now take any plant which can be covered by a tumbler. Put cardboard over its pot, and seal the slit in the cardboard, as before. Then turn the tumbler upside down over the plant, standing it on the cardboard. In a couple of hours water will gather on the glass. It must have come from the leaves of the plant, from which it evaporated. The amount of this evaporation can be roughly measured. See Fig. 40.

It is now plain that the leaves of a plant are continually evaporating a part of the water that comes from the roots. But if this is always being evaporated, then the liquid

is always denser at the top. Then the thinner solution is always pressing upward, and the leaves are easily supplied.

If the soil water were very dense, that is, if we should water our plant with the salt solution, which is heavier than sap, the circulation would of course turn the other way. The sap would pass downward instead of upward, and the plant would die.

We have not yet proved, however, that soil water has anything in solution. This can be shown by an experiment with which we must take some pains. Take some clean sand, enough to fill two flower pots, and heat it over a hot fire until you have burned everything in it that can burn. Fill the pots with this sand when cool, and in them set two plants of equal size: seedlings of corn or beans will do. Now get a few pailfuls of rain water, or melted snow. Neither of these has been in the soil. Keep part of it in one can, and put the rest in another can in which you will stir a few quarts of the richest loam that you can find. Now keep the two plants watered differently, one with the rain water, the other with the water in which the loam has been mixed. In a few weeks the second plant should be very much stronger than the other. This can only be because the soil water has brought more food than the rain water.

Well water, which has passed through the earth, has also dissolved something from the soil. Plants will grow in it better than in rain water. We can try this by fastening into slit pieces of wood or cork, seedlings of plants such as tomato or lettuce, which have no large cotyledons. Float some of these in well water, others in rain water, and see which grow the faster.

So much for the plant's need of water. But one more thing we need to understand. If we water a plant so freely that the earth is "soaking full," so that its top is always

shiny with moisture, the plant will suffer. We can see why if we take some freshly boiled water and some water from the well or the faucet, in different tumblers. Then take two rooted cuttings, or young plants, washing off all the earth. Put one in each tumbler, but over the boiled water pour a little sweet oil. The other plant will grow the better. For in the boiled water there is no air, and no air can get through the oil. A plant suffers, then, if for any reason air cannot get to its roots. Air cannot well get into soil that is full of water; and though the plant will grow, it will grow better if the soil is moist rather than wet.

We know now, therefore, under what conditions a plant grows best, and why and how it grows. The course of its growth is simple. The main root grows longer, and usually it branches, sending out threads in all directions. The stem lengthens also, makes leaves, and usually also branches. Through the membranes of the roots enters a solution of plant foods, which passes upward to every part of the plant, the water finally evaporating into the air.

But if the root is very busy, so also is the leaf. To study it properly we should need a real microscope; it is work for the higher grades. But the structure and the duty of the leaf is easily explained. Each leaf is a factory of plant foods, chiefly of starch. Through its surface it takes in a gas, carbon dioxid. The oxygen of this gas it returns to the air; the carbon it keeps. Now the color of the leaf is caused by many tiny cells containing a substance called chlorophyll. This uses the sunlight, the carbon, and the materials supplied by the roots, to make the food of the plant. A healthy plant makes more food than it needs, and so is able to grow. Indeed, it ought to make more than enough to grow with, so that it can store the starch in its tissues.

It is this stored starch that enables a plant to flower.

As we have earlier seen, the object of every plant is to make seed, and for this it is necessary first to make flowers. How this is done is shown in an earlier chapter. When the seed is made, the plant has fulfilled its purpose.

Review Questions

1. At what part of a plant does its root grow? Prove it.
2. Does a plant use water? Prove it.
3. What is a solution? A saturated solution?
4. What is osmosis? Where does it occur in plants? What solutions are in the ground?
5. What is made in a leaf? How? Why?

CHAPTER X

Various Ways of Growing Plants

We have already studied the commonest way to grow plants. In this study we spoke as if all plants can be grown from seed satisfactorily, and will make seed satisfactorily before they die. Besides, we spoke as if a root always has branches, or a stem is always plainly a stem, or a leaf is always evidently a leaf. It was convenient to imagine all this, which is true of many plants. But it is not true of all.

For example, roots may become thick and fleshy, like those of the carrot and beet, which seldom branch at all. Or part of the stem may become a tendril; or a stem may live underground and form swellings, called tubers; or it may even seem to be entirely missing. And the leaf may take the strangest of shapes, from the tiny scale of the asparagus to the thick-stemmed leaf of the chard, or the closely curled inner leaf of the cabbage.

But, what is of still more importance, some plants (like the potato) make seed very imperfectly, or almost not at all. Other plants take two years, or still longer, to make seed. Again, the seeds of some plants do not produce plants that are very much like the parents. It pays to grow peas, beans, asters, zinnias, and most annuals (or yearly plants) from seed, because the new plants are much the same as the parents. But the seeds of the peony among flowering plants, and of the potato among vegetables, cannot be depended on to produce a crop of new plants that are closely like each other. All crops vary somewhat, but these vary widely.

We have already seen, but I will emphasize again, the advantage that we gain from the fact that all crops vary. Breeders or selecters watch for plants that are better than their parents, and from their seed try again, and yet again, for still better plants. Out of many worthless seedlings they at last find just what they want. Thus have been made our modern beautiful flowers. The dahlia flower is perhaps the one which has been the most widely changed in shape and color; but larger and more beautiful flowers of all kinds are now at our service, because by careful crossing, or by accidentally found plants, gardeners have managed to improve the plant races. This is true of vegetables, also. I remember that years ago "string" beans actually had strings along the pods, which had to be stripped out before cooking. But now good pods snap clean across, and the new term, "snap beans," has come into use. And when I was a boy tomatoes

FIG. 42. — Improved dahlia flowers.

had deep furrows, and mostly had cores, far different from the modern large, smooth, coreless fruit.[1]

There is much advantage, then, in the fact that plants, when grown from seed, vary more or less widely. But when the variation is sure to be great, or the seed are few, or when the plants take years to grow, then we must find other methods of growing plants. Such methods have been studied out long ago.

The first is by division of the roots of herbaceous perennials — that is, of plants whose tops die down to the ground in the fall, but whose roots live from year to year. When they have died down, we shall find that each cluster of roots has, at the surface, buds or eyes which will make next year's shoots. This is true not only of fibrous-rooted plants, such as Japanese iris, golden glow, and boltonia, but also of the tuberous-rooted plants, such as the German iris and rhubarb. With a sharp tool, a knife or spade, we can separate the roots into two or more parts, each with an eye or more. These parts, when planted, will grow.

Another method of growing plants is by tubers. A tuber, such as a potato or a dahlia root, is a thickened underground stem, having on it buds or eyes which are capable of sprouting. If a potato, or a dahlia tuber, is planted, or even is kept in a moderately warm, moist room, the eyes will send up shoots, at the base of which roots will start. Beginning thus, strong new plants will produce new tubers. If the tubers are large, they can even be divided, so long as there is an eye to each piece.

Any one can see, of course, that there must be still another way to produce plants from tubers. The tubers can be

[1] If one's beans have strings, or one's tomatoes have cores, they may be too old, or may have had too little water. But more likely they came from poor seed.

sprouted, either underground or in a warm room; and then the sprouts, with the roots that spring from them, can be carefully cut away and planted separately. By this means expensive tubers can be made to yield the most, for every single eye is made to produce a separate plant.

Another method of producing plants is found in bulbous plants. In this class I include not only the true bulbs, such as those of the lily or onion, but also corms, such as those of the crocus. All of these produce small bulbs or corms, either within or close beside the parent. These, dug up every fall, and stored and planted in the spring, will in a couple of years grow to full size.

FIG. 43. — LAYERING.

The buried bark is cut or broken, and will then strike root.

Again, plants may be reproduced by layering. Here we take advantage of the strange fact that if the stem of a plant, while it is still attached to its root, is bent underground and then up again, it will strike root from the buried part. The bark of the buried stem must usually be cut or broken, in order to allow the making of roots. When the layered stem has rooted well, it can be cut off from the parent plant, and set elsewhere.

Tip-layering is burying the tip of a shoot, which with certain plants (the gooseberry is one) will root in the same way.

Some plants (like the blackberry) send out parts underground, or (like the strawberry) above ground. These parts

either send up shoots or send down roots. When cut away they will grow, and can be set elsewhere.

A very important method of growing plants is by means of cuttings. By this method a few years will see a small stick of poplar transformed into a tall tree. Every year nurserymen and greenhousemen use cuttings to start many thousands of plants of different kinds: roses, geraniums, begonias, grape, willows, privet. Fresh pieces of stem, of root, and sometimes even of leaf, are simply set in moist sand or earth;

FIG. 44. — Tip-layering of black raspberry.

and if the work is properly done, the cutting will strike root and send out leaves. The methods of making cuttings vary with the plants. Here are directions for some of the simplest.

For rooting cuttings in the house, one should have a box about five inches deep. In the bottom of this, holes should be bored to let out water. Then should be put in an inch of gravel or broken pots, and then four inches of clean, sharp sand, not too fine.

The cuttings are made from almost any of the house-plants, balsam, roses, geraniums, fuchsia, and others. They should be taken from near the tips of the shoots, where the stem may be snapped off. If it bends without breaking, it will not do. The cut should be made just above a joint, and should be

slanting. Then some of the leaves should be stripped, and the rest trimmed a little, so as to leave for each cutting but a few inches of leaf. These cuttings should set in the sand to a depth of about two inches, and the sand kept *wet* and *warm* until the cuttings have struck root. They may stand pretty close together, and occasionally, after about ten days, one or more may be examined to see if the roots have started. When the end of the cutting has healed over, roots are sure to start soon.

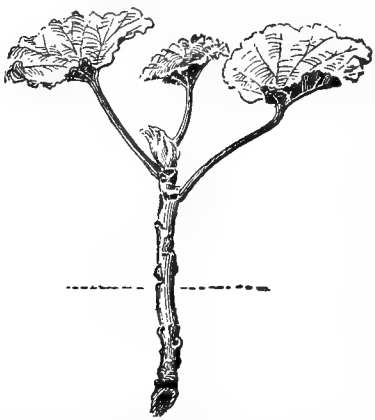

FIG. 45. — Softwood cutting, a geranium. Line shows depth to plant.

The box of cuttings should be kept in a room that is warm in the daytime, and never less than 50 degrees at night. It should have plenty of light, but should be shaded from the hot sun except for a little while each day. The cuttings start best if heat is applied below, by setting the box on a radiator. And they may be helped if the box is set in another, with glass laid on top. But the air in this outer box should not be kept too moist, for fear of disease; and so the glass should not be tight, and should be occasionally entirely removed.

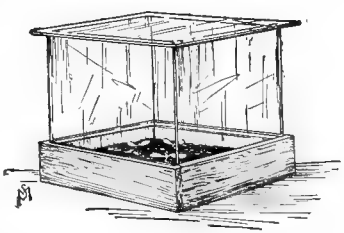

FIG. 46. — Box for starting cuttings. Do not keep it too moist.

From such plants as the begonia and gloxinia, cuttings

may be started from leaves. A triangular piece is cut off, and one side is set in the wet sand. Or the leaf may be laid

FIG. 47. — Begonia leaf-cutting. Small plants are starting when the leaf has been pegged down.

on the sand, face up, and pegged down through the veins. At these broken veins, or at cut places on the edges, similarly held to the sand, plants will spring up.

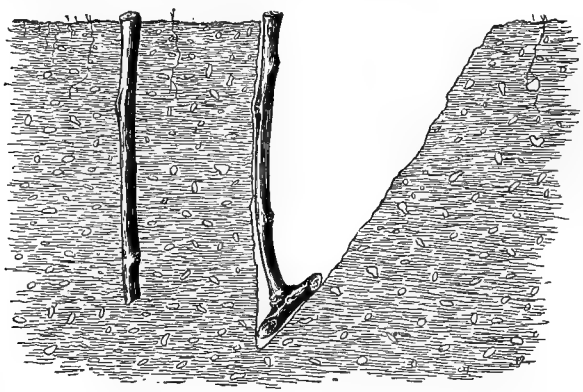

FIG. 48. — PLANTING HARDWOOD CUTTINGS.

Set the upper bud near the surface. A trench makes it easier to plant cuttings taken with a "heel" of older wood.

So much for softwood or leaf cuttings. Hardwood cuttings are different. They should be seven or eight inches long, taken from such plants as dogwood, privet, grape, forsythia. The cuttings should each include two or more buds. If taken in the fall, they should be bundled, and buried where they will remain moist, but not frozen, all winter. In the spring they should be set, butt down,[1] in moist earth, and tended well. It may seem a long time before leaves appear, but they will finally come.

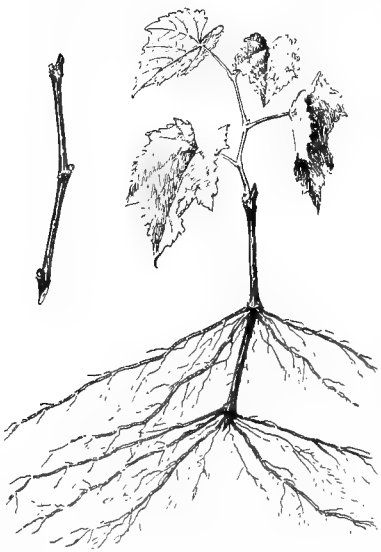

FIG. 49. — A grape cutting and its growth in a year.

Root cuttings of the blackberry, raspberry, sea-kale, and horse-radish, are handled much in the same way, except that in the spring they are planted horizontally, about two inches down.

Hardwood cuttings, if taken in spring, are simply planted at once. Their rooting will take longer.

FIG. 50. — Root cutting of blackberry.

These are not all the methods

[1] It is well, while making the cuttings, to trim the butts slanting, the tops square, in order to tell them apart. The cuts should be made with a sharp knife, not with pruning shears, which bruise the bark.

of making new plants, but they are all that we need to know. Working at school or at home, in summer or in winter, we can in these ways make certain kinds of new plants more quickly and surely than by sowing seed.

Review Questions

1. What is root division?
2. What are tubers? How do they produce plants?
3. How do bulbs increase their numbers?
4. What is layering? Tip-layering?
5. What are soft cuttings, and how can they be made to strike root?
6. What are hardwood cuttings, and how should they be handled?
7. What are root cuttings? How would you plant them?

CHAPTER XI

The Soil

At first sight, what is so uninteresting as a handful of dirt? One's first idea is to throw it away and wash the hands.

But wait a bit. What can we do without dirt? Suppose the earth were what wise men say it once was — naked rock? How clean! We should not get dirty from it. Yet about dinner time, how should we get food? No vegetables could be had, certainly. And no meat, since animals and birds depend on vegetables. We would then gladly exchange our nice clean rock for a few acres of good rich dirt in which vegetables were growing.

Save the handful of earth, then, and look at it respectfully. Through ages it has been made from the naked rock, until now it is full of life. Look, a worm is wriggling in it. Don't hurt him; he is a good friend. A beetle scuttles away from it. He may be an enemy. Under the microscope we should find this handful of dirt swarming with tiny living things called bacteria. They do valuable work in making plants grow. Keep the soil moist, put it in a warm place, and in a few days we shall note the sprouting of the seeds that have been concealed in it.

This handful of earth is worth study. Let us see what we can learn from it.

Let me begin with my statement that this soil was made from rock. Look at a bowlder lying in the field, the stones in an old wall, or even the bricks of a very old house. The

surfaces are rough to the touch, the edges are rounded, there are cracks here and there. Study the face of any cliff, note its great cracks, and see what huge fragments have split off and are lying at the bottom. Look at the stones in a brook: they are rounded, and where they are softest there they are worn away the most. After a rain the brook is cloudy with mud. All these things show the effect of air and water, sun and frost, on the rocks. The sun and the frost crack the stone, water works in, dissolves some of the stone, and, freezing, makes the crack wider. Fragments, falling, break against each other; the brook grinds them heavily, and slowly they become smaller and smaller. They are made into sand.

Where these smaller pieces are thickest is of course the bottoms of slopes and the mouths of rivers, where water has carried them. But to go farther into this takes us into the study of geology.

Among the small fragments, and in the hollows of the rocks where dust had settled in the cracks, grew the first plants. When they died they decayed, and made food for later plants. The dead matter mixed with the broken rock, and darkened it. This was the beginning of loam.

Let us study a handful of the loam which we took from the garden. Get a tall, narrow bottle: a stuffed-olive bottle is perfect for the purpose. Into this put two tablespoonfuls of the loam, after you have picked out everything, whether stick or stone, that is big enough to be noticed. Fill the bottle nearly full with water, cork it or stop it with the palm, and shake as vigorously as you can. If at first the earth clings to the bottom, stir it with a stick. Then when the whole is swirling violently, put the bottle down and let the contents settle. Watch it.

You will notice that almost at once you can see grains, as

of sand, forming a layer on the bottom. Presently these grains become smaller, though you can still see each one. But after the first minute the settling earth begins to show as a layer of very fine material; and at the end of five minutes that which is coming to the bottom is now the very finest of mud.

Thus we have made this loam show what it consists of: first coarse sand; then finer sand; then what is called silt, or fine earth; and at last very fine particles which scientists call clay. We are told that it takes 400,000 of these last, set in line, to measure an inch.

Above this in the bottle is left dirty water, in which are floating, at different depths, particles which evidently will not sink entirely to the bottom.

To separate these parts of the loam, provide three tumblers. Once more put into the bottle earth and water, and shake it up. When it is in strong commotion, set the bottle on the table, and wait till you count five, slowly. Then quickly, but without stirring up that which has already settled, pour the muddy water into the first tumbler. Leave it there till you count thirty, slowly, and then pour the liquid into the second tumbler. Leave it now for a full minute, or a little longer, and pour into the third tumbler, where the water is to be left half an hour, or even overnight. When at last the water is poured away (notice again that it is discolored, and has certain particles floating in it), we are ready to examine the four kinds of soil which we have separated from each other.

In the bottle is coarse, almost gravelly, sand.

In the first tumbler is sand, varying from medium to fine.

In the second tumbler is silt.

In the third tumbler is the finest and smoothest deposit. It is clay.

This experiment can, if we please, be tried with more tumblers, to the number of six or seven. It is plain, how-

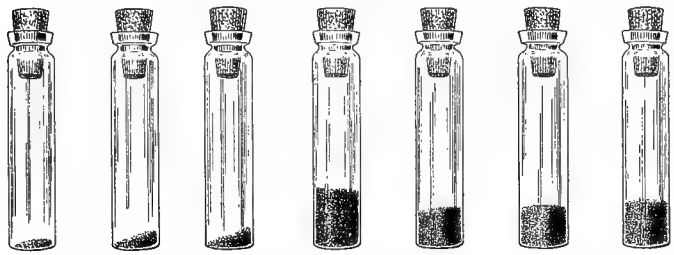

FIG. 51. — THE MAKE-UP OF A SANDY LOAM.

The first five bottles show different grades of sand. The next two show silt and clay. Such a soil naturally drains well.

ever, that we shall only separate our grades of earth into classes that will not be of much value to us. We have already found the important parts of loam, in coarse and fine sand, silt, and clay.

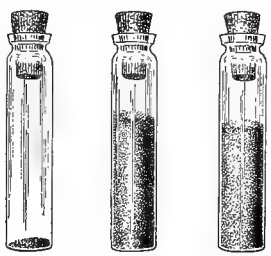

FIG. 52. — THE MAKE-UP OF A CLAY LOAM.

The left hand bottle contains sand, the next silt, the next clay. Such a soil is naturally moist.

If now different members of a class examine in this way the loam from their gardens, wide differences in them may be found. One may have more sand, another more silt, another more clay. Names have been given to these different earths: sandy loams, medium loams, clay loams. Even without such an examination the loams can roughly be distinguished from each other by their color, for the sandy loam is light brown, the medium a medium brown, and the clay loam a dark brown that at times almost becomes black.

It is plain that the sandy loam, being the coarsest, has the fewest soil particles, and that the clay loam has the most. Suppose you try drying out the finest of the mud: it becomes a very fine dust. To count the particles of this dust, or even of the sand, would be a very difficult task, yet it has been attempted. The conclusion was that a gram (that is, less than a third of an ounce) of sandy loam contains about two billion soil particles. This number increases steadily as the loam grows finer, until the clay loam sometimes contains twenty billion particles per gram!

But we are far from finding all the important parts of the loam. Sand, silt, and clay are very important, but we must not forget those particles, more or less water-soaked, which we saw floating in the water. Let us examine the tumbler containing the fine clay, or the coarser silt. As we look down into it we see that the layer at the bottom is by no means made up of little particles, all small and round. Here and there, in fact quite plentifully, we shall see what seem to be little short hairs, or the tiniest of sticks, bent or crooked, lying among the rock particles. These are not made of minerals. No, they were once alive, are bits of roots or leaves, which have rotted in the soil. "Decaying vegetable matter," or "humus," — that is what we have discovered.

Those floating things in the water are of the same sort, but not yet so rotted as to be waterlogged. And the dirty water is the soil water to feed the plants, with the very tiniest of particles still suspended.

But did we pour away all the water? Take some of your silt and stir it in the sun, or heat it over a fire. It grows lighter in color, and you know why. It is drying out. Water, then, is present in every garden, clinging to each particle. In fact, every tiniest particle of soil is coated with a film of water.

One more discovery, and we have finished. Between these soil particles in our handful of dirt, each one coated with water, there must be air. That is the last thing we shall now look for in our handful of dirt. It is true that the chemist and the man with the microscope have more to say, but for the present we have gone far enough in our examination of the soil.

The soil or loam in our gardens, which is made of sand, silt, clay, and humus, was mixed by nature through hundreds of years. We ourselves can mix soils for our own purposes. We can take sand (coarse or fine), ordinary loam, mold from rotted leaves or sod or manure, and by mixing them can produce soils that are more or less rich, or more or less loose, according to the needs of the seeds or plants which we mean to grow in them.

And upon some mixture of the kind, with water and air, depends every living creature in the world. The savage may feast on the lion that preys on the antelope, but the antelope lives on grass. Take away the grass, and you take away also the antelope and the lion and the savage. Even civilized man, with all his cleverness, would surely starve to death if vegetable life had no soil to flourish in.

Review Questions

1. How is soil made? What is loam? Subsoil?
2. How can you test any loam? What parts can it be separated into?
3. What are the three chief kinds of loam? To which does the loam in your garden belong?
4. What is humus?
5. Explain the making of a loam for indoor work.
6. Could we live without soil? Why?

CHAPTER XII

The Soil Water

Without water the soil cannot feed plants. It is wise to know why and how the work of feeding is done. For this purpose, and in order to understand the differences in soils, let us get soils of three kinds — clayey, sandy, and loamy or medium — with some very well-rotted manure or leaf mold. Get also some tumblers, some flower pots of the right size to stand upon them (not fit into them), and a pan and pitcher or two. Get also a graduate, or pouring vessel marked off into pretty fine divisions. It can be bought at a photographer's. Tin cans may serve instead of flower pots, but they should have holes punched in their bottoms.

In the first place, since soils get their water from the rain, let us understand what happens when the rain falls. Fill pots, or cans, with the different kinds of soil, and if pure sand is convenient, use that also. Fill a pot with manure or mold, well packed. The experiment will work better if the soils have been thoroughly dried, and in any case they should not be moist. Stand each pot on a tumbler.

Now into the pot containing sand, or sandy loam, pour water from the graduate, which should be filled to the top. Pour slowly, moving the stream about on the surface so as to wet the soil thoroughly. As soon as water begins to drip into the tumbler, stop pouring, and record the amount poured into the soil. Do this with all the other soils, and note the different amounts of water which each will hold.

If you have no graduate, weigh the pots before and after pouring, and note the differences. Either of these experiments will show that the sandy soil holds least, the clay soil holds most, water.

To understand this, dip a pebble into water, and notice that you cannot shake all the water off it. It remains moist until it dries in the air, or is wiped. Every tiny grain of soil is like the pebble, for it will take and hold a film of water. But now take a piece of wood, best a cube of an inch, and estimate its surface. Split it once, and see how much the surfaces measure now. In the case of an inch cube, two square inches of water-holding surface have been added by splitting. Split again, and yet again, and you will see how rapidly the surface increases. In the case of soils, this shows that the finer soils naturally have more water-holding surface. Therefore, of course, the clay soils will hold more water than the sandy.

If the manure, or leaf mold, has been of good quality, and pretty finely ground, it will hold more water than any of the soils. This is because, unlike the rock particles, it does not merely hold the water on its surface, but soaks it in like a sponge. To show the difference, take a pot of sandy loam, and another in which the loam has been mixed with one quarter of its amount of manure. Then, as before, find the amount of water which these two will hold.

We can conclude from all this that the finer the particles of a soil, the better it is able to supply plants with water. (Other reasons may interfere, of course, to show why, for certain plants, clay soils may not be the best after all.) We can also conclude that manure added to a soil will enable it better to hold water.

Let us try our first experiment over again, first plugging the holes in the pots, and then pouring in the water until it

stands clear on the surface. Much more water will be needed for this, since we have not merely wet all the particles, but have filled all the spaces between them. The air is all driven out of the soil. The difference between the different kinds of soil is not great, although still the clay and the manure hold most moisture. Now draw out the plugs and let the extra water run away, noting with the watch how soon the drip becomes very slow. As we should expect, the pot of sandy soil gives off most water, but also gives it off quickest. Left standing overnight, the clay pot may still be dripping in the morning, after the sandy pot has given off all it can. To put this differently, the sandy soil has quickest filled itself with air.

Sandy soil is, therefore, soon ready after a heavy rain to receive seeds or nourish plants. Clay soils may be a day later. Clay soils are therefore late soils, and sandy soils early. This shows itself especially in spring, when a sandy soil is often ready for planting many days earlier.

This study of the quickness with which soils lose their extra water shows us why florists put gravel or broken pots at the bottom of flower pots of any size. It is to help the water to drain away. Now in the fields there is usually, under the loam, material that serves the same purpose. The subsoil, the lighter soil which lies under the dark loam, is commonly stony, gravelly, or sandy, and rapidly leads the free water away. But sometimes under a whole field, or parts of it, will lie hardpan or clay, neither of which readily lets water through. Or sometimes springs are so numerous in a field that the subsoil, however good, cannot take the water away. In these cases the loam will be wet, or even swampy.

When this is the case something must be done to the field in order to lead the water away. That is, it must be drained. Open ditches, which act like brooks, taking the water to a

lower level, are the simplest drains, but they are troublesome. It is better to fill the bottoms with something to conduct the water away, and then to fill in the ditches. Large pipes of hard-baked clay, specially made, called drain tiles, and laid with a slight slope, are the best things for this purpose.

All this has to do with the movement of water downward in the soil. But curiously, water moves upward as well. To show this, let us fill four pots with our four different kinds of dry soil, varying from sandy to clayey. Set the pots in a pan, and in it pour an inch or more of water. Naturally some of the water makes its way at once inside the pots, and stands at the level of the water outside. But look at the pots after half an hour. The water in the pan has lowered, while at the same time it has risen in the pots, till before very long we see it glistening at the surface of all of them.

This upward movement of water is called "capillary action," because it was first discovered in the case of fine tubes, such as the hair-like (or capillary) tube of a thermometer. Set a broken thermometer tube, containing no mercury, and open at both ends, in water, and the water in the tube will climb above the surface of the water outside. Or lay two plates of glass, one above the other but kept from touching by a needle laid between them, slanting into water. The water will climb out between them, and will climb highest where the plates lie closest.

Capillary action is useful in lamps. We can see how a wick works, if we take a tumbler half full of water, and from it hang a wet wick over into an empty one beside it. The water will continually climb the wick and drip into the empty tumbler. In the same way the wick of a lamp continually feeds oil upward to the flame. And in the soil, the particles that touch act as wicks or tubes to lead the water upward by capillarity.

Thus when, after a rain, the free water has drained away, the film water, remaining, tends to climb upward as we have seen it do from the pan. It will keep on climbing as fast as it dries away at the top, and so will finally dry out. That is bad for any garden, but it can be prevented. To find out how, take four flower pots, and fill them with *wet* soil to within an inch and a half of the top. Now fill the first entirely full with the same soil, packing the surface as rain would do. Into the second put more soil, but loosely, and keep it loose by stirring, so that the water shall not come up

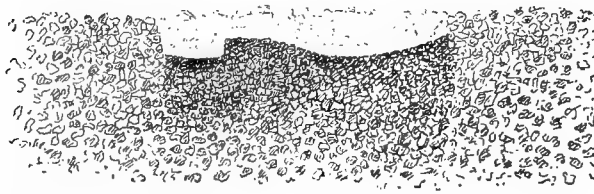

FIG. 53. — A foot print in mulched soil. Capillarity and drying are rapid where the shoe has packed the earth.

from below. This covering of loose soil will presently become dry. Into the top of the third put an inch and a half of very fine rotted manure, or chopped straw, or even bran. Cover the fourth closely with a piece of waxed cardboard, cut to fit the pot. Now weigh all the pots, and continue to weigh them once or twice daily for three or four days. Record the weights, and finally compare them. The first pot has dried fastest of all, the last the slowest.

It is probably plain that if we could cover the surfaces of our gardens with rubber sheets, or boards (have you ever noticed that the bare earth beneath a board is always damp?), or something else which, like our waxed cardboard, will not let the water out, the soil would dry only by evaporation from

the plants. But the next rain could not get in; and besides, such a covering is not practical. A loose and pretty light covering, like old manure, is very much better, and is often put around plants. Straw is sometimes laid on the bare ground of a potato patch, and makes a fine protection against drying. But cheapest and simplest of all is simply to stir the surface of the garden after a rain, to the depth of a couple of inches. The loose dirt speedily dries out in the sun, and crumbles to dust. Of course we have lost the moisture that it contained; but the dust preserves the water that remains below.

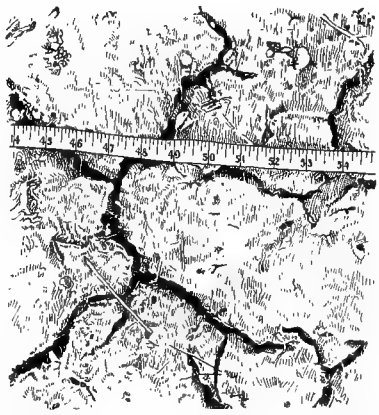

FIG. 54. — A clay soil left too long after a rain. It has baked, and is drying out through the cracks.

This stirring of the surface is called cultivation, and the dust covering is called a mulch. When we spread manure or lawn clippings around a plant, to save the moisture, we are mulching it. "Dry Farming," in our very dry regions, depends on very deep cultivation, continued the year round except during frost, to save the water.

Take now our four pots of soil, which are shiny with the moisture which they have taken up from the pan, and see which of them will first allow the making of a mulch. Use a table fork. The sandy soil will allow it almost at once, and the sandier the better for this purpose. The clay soil cannot be stirred sometimes for a day or more without running the danger of making lumps. These lumps, set in the

sun, will often bake hard. Again, a clay soil, if left too long, will bake, crack deeply, and dry out through the cracks. The sandy soil, therefore, has an advantage over the clay soil.

Again, take the four pots, wet to the top, and set in the sun after taking the temperature of each. Record the temperature throughout the day, and see if the sandy soil does not warm up much the fastest. If you had cultivated it first, it would have warmed faster still. A clay soil will therefore take much longer to warm in spring, or after a rain. If you looked for a reason you would need to be told that evaporation (or drying) continues longest from the wet clay, and that evaporation chills. That is why your wet hand feels cold when you hold it in the wind.

We have now found two advantages of the sandy soil over the clayey. For a crop that needs a quick start in spring, or which wants warmth more than a great supply of water, it is the better soil.

As we think over the kinds of soil and their advantages, we wonder how we can change what we have in our garden. The sandy soil often holds too little water. We can improve it by working into it manure, which holds water well. We could, of course, work clay in, but as clay is hard to handle that is seldom done. On the other hand, sand is often worked into clay soil, to lighten it. Very fine coal ashes will also improve clays. But best of all is manure, whose fine light fibers do the same service, and which provides plant food in addition.

There is yet another method of improving clay soils. We have seen that they puddle, that is, cake, when worked too soon after a rain. A clay soil plowed too soon in spring may be injured for two or three years by this caking. To show the difference in soils in this respect, make mud-balls of the

different kinds of soil, and set them in the warm sun or on a stove. The sandy ball will crumble away, the loamy soil will cling longer, and the clay ball will bake hard. But moisten it, and set it outdoors on a freezing night, and it will begin to break up. Clay soils plowed in fall are usually improved by the winter's frost.

Finally, clay soils may be improved by lime. To show this, get a lump of stone lime about the size of a hen's egg, and slake it in water until the mixture is a creamy whitewash. Get four four-pound lots of clay soil. Mix the first with a half ounce of the whitewash, the second with an ounce, the third with four ounces. With the other put plain water, or none at all, if the soil is moist. Now mold the four samples into balls of uniform size, and allow them to dry and harden. Finally test them by dropping from different heights. Those which have the most lime will break the easiest.

This happens because the lime has made the fine particles of clay cling together in groups, like grains of sand. To show this, mix water with our whitewash, let it settle, and draw off into a bottle some of the clear liquid. Into another bottle put pure water. Drop into each some clay, shake vigorously, and allow both to settle. From the lime water the clay will settle quickest. If the water is poured off, and the soil taken out and dried, the limed clay will be granular (grainy) and will crumble quickest.

To improve a clay soil, therefore, lime should be worked into it.

We ought to know, now, something about the soil of our gardens, how they will act and how to improve them. If you have tested the soil of your garden, write in your notebook how to make it better. Calculate the cost, and plan how to get the money for it.

Review Questions

1. Which of the three kinds of loam holds the least water? Which the most? In each case, why?
2. How does a particle of soil hold water?
3. How does manure hold water?
4. What are early and late soils? In each case, explain why.
5. Can you explain the advantages of a medium soil?
6. How can water be drained away from the soil? Under what conditions should this be done?
7. What is capillarity? How does it act in a soil?
8. How can loss of soil water into the air be prevented? Why should it be prevented?
9. How can we improve a soil that is too late? Too early? A clay soil?

CHAPTER XIII

Plant Chemistry

Chemistry, the science which studies what everything is made of, can tell us a good deal that we never could guess by ourselves. For example, the air that we breathe is not one thing, but three or four, and is made chiefly of the gases oxygen and nitrogen. These are called elements, because they cannot be farther divided. Other elements may be common, such as iron, silver, gold, lead; but not all common materials are elements. Water is made of hydrogen and oxygen; salt is made of sodium and chlorine; wood is made of several elements, different woods being different in their make-up. These are all compounds. The chemist, by methods which we do not need to study, can find out the elements of which any compound is made.

Plants, he tells us, are made chiefly of thirteen elements, some of them in very small amounts. They are combined in various ways. Water is the largest part of any growing plant, and even when these plants are dried water is often still the largest part. Grass, when it is dried into hay, loses most of its moisture; but turnips, cabbages, and other such crops, keep their moisture for a long time. Shred some cabbage, or slice a turnip or potato, weigh it, and set it over the fire, or in the sun, until it is quite brittle. Then weigh it again, and see how much water it has lost. If you want to see how much more water can be driven off, put it in an oven which is not so hot as to scorch the plant, and then weigh again.

The matter which remains from a plant after this thorough drying is chiefly some compound of carbon. Carbon we know best as charcoal; but when crystallized it is the diamond, or the lead of our pencils; and when combined with other elements it takes various forms, the chief of which in plants is starch. Finally, besides water and carbon, the most important chemicals in plants are phosphorus, potash, and nitrogen. These, at least, are the elements which it is most important for us to supply, since they are the elements without which plants suffer.

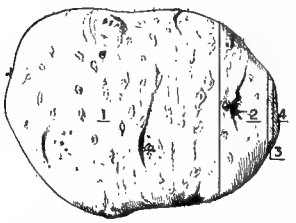

FIG. 55. — The chemical make-up of a potato. 1 represents water; 2, starch; 3, nitrogen; 4, all other elements.

We studied in the last chapter how to save water for the use of our plants. Carbon we do not need to trouble about, for the very good reason that plants get most of their carbon from the air. The amount of carbon in any given amount of air is so small that I did not mention it just now when telling what air was composed of. In ten thousand parts of air there are but one and a third parts of carbon; yet so vast is the amount of air over the earth, and so rapidly does it change among the leaves of the plants, that it supplies most of the carbon for all the plants that grow on the earth.

The other three elements we must supply. But first it may be asked why we have to take pains to supply plants with any food. Truly, in wildernesses no food is supplied by man. The forests grow, and maintain themselves for centuries; year after year the swamps grow rank with grasses. But this is because that which dies lies and rots on the ground, returning to it the food which once it took up. Even when man comes into the forest and takes away logs, he leaves more than

half of every tree to supply food for new ones, for the roots rot in the ground, and the branches rot on the surface, while only the trunk is carried away. But when the farmer carries away from his fields the stalks and the ears of corn, digs up his potatoes and hauls away their tops, and takes both the seed and the straw of his grain, then he is taking away, so most chemists agree, more than the soil is able to replace. If this goes on year after year, the fields are starved, the plants spindle, and the farm is finally abandoned by the discouraged owner.

If a man wishes, therefore, to keep his farm or his garden in condition to yield well, he must return to the soil as much as he takes away. In this way the garden becomes a factory. Into it he puts cheap chemicals, the "raw materials" of his crops. The garden turns these into expensive chemicals, the crops themselves. These he sells or uses, and thus he makes his profit.

The chemicals which he applies to the soil may first be other crops, grown at a convenient time, and plowed under in order to rot. Clover, vetch, rape, and rye, are often used in this way. The chemicals may be, occasionally, parts of the crop that used to be carried off. Thus on large wheat farms the farmer may harvest only the seed, leaving the straw to be plowed down. Manure contains chemicals which are valuable for plants. But in most cases the chemicals which the farmer supplies are minerals. They are bought by the ton or by the bag, look often like dirty table-salt, are scattered on the surface, and are plowed or harrowed into the ground.

It is odd to think that we can feed plants in this way, and that ground rock can beautify our gardens. The fact is, however, that we may use not only this but other things, for fertilizers. Material which otherwise would be thrown away

is put to this excellent use. Scraps of leather, hoofs, horns, and hair, bones, fish, dried blood, and other waste products

FIG. 56. — Golden-banded lily, one of the most beautiful of flowers. How does it depend upon chemicals?

of the factories, are used in this way. The Indians used fish as fertilizers, and taught the use to the colonists. And we can use these things as plant food because the plants have a method of absorbing them.

This is done by means of the root-hairs, whose walls give out an acid. Vinegar is an acid, but a weak one; there are

others strong enough to eat metals, but the plant root acid is very weak. It is strong enough, however, to dissolve the food that it needs, in order to make the solution which, by osmosis, will pass through the walls. And if we grind our fertilizers very fine, so that the root-hairs can easily get at it, then the plants flourish the better.

The kinds of fertilizers which can be bought are so many as to puzzle any one who is not an expert. It is true that if one is to grow large crops of single kinds, such as potatoes or corn, one should buy special fertilizers. For corn naturally needs one kind of food, while potatoes need another. But for the gardener, who has at most but a few rows of each, it is impossible to have a fertilizer for every crop. I will tell you, then, the simplest method of buying and using fertilizers.

In the first place, buy of a man whose word can be trusted, and buy of him only "high grade" fertilizers. "Low grade," though cheaper, are too cheap to be worth getting. Next, buy but two kinds, since our garden crops can be divided into two groups of plants.

In the first group stand all those which are grown for their leaves and stalks: spinach, chard, cabbage, onions, cauliflower (which we never allow to go to seed), beets for greens or for very young beets, asparagus, lettuce, celery, parsley.

In the second class are the plants grown for their roots or fruit or seed: peas, beans, the squashes (with cucumber, melons, marrows), tomatoes, turnips, carrots, winter beets, parsnips, radishes, corn, potatoes, flowering plants.

The differences between the two are these. In the first class are all the plants which are to grow rapidly and luxuriantly. We want such plants to be slow in making flowers and seed, or in storing food in the roots. In the second group are all the plants which we wish to be quick in flowering, in making

seed, and in growing large roots. We try to feed these two kinds of plants according to their different purposes.

For the first group we ask the dealer for his best "top-dressing." This is meant specially for grass and the lawn, but it also encourages top growth in other plants.

For the second group we ask the dealer for his best potato-fertilizer. This encourages the potato to lay up starch in tubers, but it will also encourage other kinds of plants to make flowers, fruit, and seed.

The chemist will tell you that the difference between these two is that the first fertilizer contains, as compared with phosphorus and potash, much nitrogen, while the second contains little of it. And with these two fertilizers we are ready to feed anything that grows on the ordinary home place.

You see what nitrogen does to plants: it encourages them to make leaves and stalks. Therefore if you wish a plant of any kind, which is not doing well, to grow rapidly, give it a little nitrogen. Apart from our top-dressing, this can be conveniently applied in two forms. The first is nitrate of soda, a salt. The second is water in which fresh manure, which is rich in nitrogen, has been soaked.

We can easily test the value of nitrogen in encouraging, or stimulating, plant growth. Take three pots of *sandy* earth. In a quart of *rain* water (or melted snow) dissolve a half teaspoonful of nitrate of soda. In another soak a little fresh manure (horse, cow, or both) and strain out the water as soon as it has the color of weak tea. In one pot pour an ounce of the nitrate water, in the second pour an ounce of the manure water, measuring by means of the graduate or an ounce bottle bought at the druggist's. Or use two and a half tablespoonfuls. Pour the water carefully all over the surface, and wash it in with an equal amount of rain water. Mix the soil well.

To the third pot add nothing. Label each of the pots, and in each set a couple of young plants or sprouted seed of corn, wheat, or whatever is at hand. Water the pots, whenever necessary, with the rain or snow water, lukewarm. You will presently see a difference in the three plants. Describe this in the note-book, and explain it.

There is another thing which chemistry has taught us to do to the soil. Plants sometimes suffer when there is too much acid in the soil. If plants do not grow well in our garden earth, we can test it for acid by means of a strip of litmus paper bought at the druggist's. It is blue, but when buried in a tumbler of muddy acid soil, it will turn red. This test should be made with care, and the paper should not be handled with damp fingers, for they themselves are likely to be acid. If upon testing a soil we find it acid, we can improve it by adding lime. This we can do to a handful of soil in the schoolroom by means of a little limewater; but in the garden, lime is scattered and raked in. Thus for the second time we find that lime is good for soils. But it is not a plant food; it is rather a soil improver.

There is no need, at present, to go deeper than this into the chemistry of soils. But the little that we have learned will be very valuable in our work.

Review Questions

1. What are chemical elements? Compounds? Name a few.
2. What makes up the largest part of any growing plant?
3. What compound makes up the next largest part? Where does it come from?
4. What elements do we need to supply to a plant? Why?
5. Can you find a good reason why cheap fertilizers are expensive?
6. What is the special value of nitrogen? How can it conveniently be supplied?
7. How can we tell if a soil is sour? How can we sweeten it?

CHAPTER XIV

Humus

In the last chapter we studied how nature takes care that the soil shall remain fertile, if only man will not interfere. She restores chemicals to the ground by means of the rotting of the fallen plants. But at the same time she is keeping up the supply of what we have already mentioned as humus, which is decaying animal or vegetable matter. Every animal, insect, or plant, that falls and lies in the field, adds humus to the soil.

Humus is important for several reasons. We know already that it enables the soil to hold moisture, and that it improves clay soils by making them lighter and warmer. We can easily see that it contains chemicals on which plants can grow. But beyond this it improves the soil by bringing about two kinds of changes in the soil. One is a chemical action, by which a carbon compound (carbon dioxid, the one that supplies carbon from the air) is set free to act in its turn on the chemicals in the soil. The other is a bacterial action, by which bacteria (those tiniest of living things, of which there are at least thirty million in every ounce of soil) are encouraged to live on the decaying humus. These bacteria take the nitrogen in the soil, and make it ready for plant use.

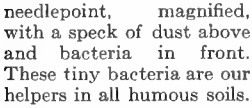

Fig. 57. — The finest needlepoint, magnified, with a speck of dust above and bacteria in front. These tiny bacteria are our helpers in all humous soils.

Thus for good gardening humus is needed. It is true that

we can take rain water, which we know has no plant food in it, and by adding chemicals alone we can grow in this water plants that will live for years. Small trees have been grown in this way, but of course it is very little worth while, except to show what can be done. We must grow our plants in the earth, and humus is necessary for us.

But when we take our crops from our gardens we are using up the humus, and giving nothing in return. If we wish to keep the soil in good condition, we must therefore find some means to restore humus to it. The ordinary gardener uses three methods.

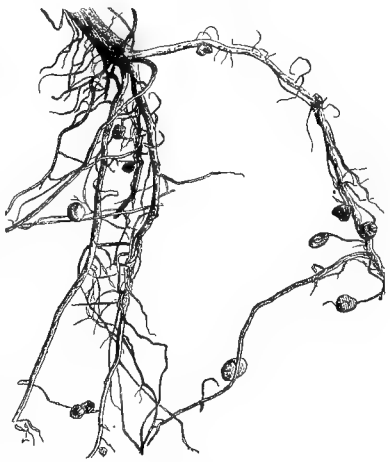

FIG. 58. — Nitrogen factories. Bacterial colonies on roots of bean.

The first is to grow, in each part of the garden that is unoccupied by a crop, plants that can be dug into the soil, and rotting there, make humus. This is called green manuring. The best plants to use for this purpose are the clovers and their family, called the legumes. These plants give most nitrogen to the soil, and in a very peculiar manner. Long ago the Romans knew that legumes did good to the soil, but they did not know why. Not many years ago some one discovered that legumes have on their roots little knots, or knobs. These were at first considered to be signs of disease; but they were presently discovered to be colonies of the bacteria which best make soil nitrogen. They use

the plant to get nitrogen, not from the soil, but from the air, so that legumes leave nitrogen in soils where previously there was none. The legumes, then (the clovers, the vetches, alfalfa, peas, beans), are the best plants for green manuring. But most other plants will do.

The second method of returning humus to the soil is to dig into it the useless parts of all plants that grow in it. The roots usually remain, but the tops of potatoes, corn, peas, and beans, the unused leaves of cabbage, and such things, are commonly carried away, and are often given to the pigs or chickens. Of course to dig such things into the soil means that they may, before they rot, be very much in the way of cultivation. Therefore it is better still to heap them together for a year or more before they are brought back to the garden. They then all rot together, and finally turn into compost, a rich dark loam. This is the best of plant food.

The third method of supplying the soil with humus is to use manure. Manure is, of course, only the food-stuff for the horses and cows after it has been used to produce labor or milk. Sheep and pig manure in the same way have come from the soil, and can be returned to it. But like cornstalks and other such things, manure is best after it has rotted for a while, as it is then ready for the use of the plants as soon as it is dug into the soil. Manure ought, therefore, to be heaped together for some months, until it is rotted.

But this heaping together of manure is not so simple a matter as the piling of the stalks and leaves that are taken from the garden. Even cornstalks are liable to "heat" and to "burn," and therefore to spoil; but this seldom happens. Manure, however (I am speaking of the most common kind, horse manure), is certain to develop great heat, so that if left alone it will actually become light and feathery, almost like

ashes, and of very little value. In order to prevent this the heap must be tramped when first it is made, and every little while it must be turned over and moistened. The heat that then develops does no harm, the manure rots the quicker, and the heap packs down into the "well-rotted manure" which is the desire of every gardener. To make it is not easy. The owner must not let the rain get at the manure,

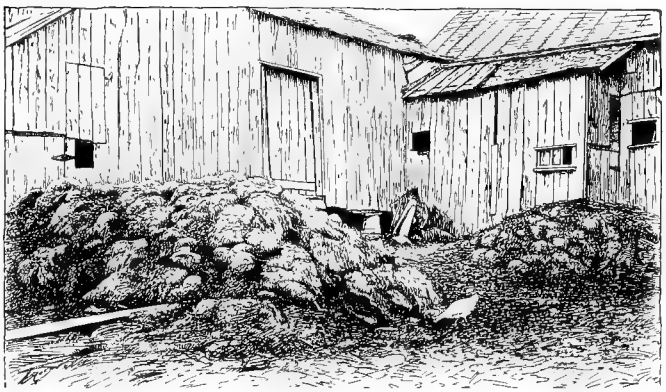

FIG. 59. — WASTE IN MANURE.

Rain washes out most of the nitrogen. Keep the manure under cover.

for rain will wash out the chemicals. He must himself not wet it too much, for the same reason. He must remember to turn it whenever it begins to heat. But in the end it is ready to go back to the land, returning there what it took away.

The various manures have different values. Hog, sheep, and hen manure are rich in nitrogen, but have not much humus. For that reason horse and cow manure are better. Perhaps the best general manure to use is a mixture of these two. The bedding should have been straw, and

never sawdust, which will turn sour. The two manures should be well rotted and thoroughly mixed.

One thing ought to be remembered in making good manure. If possible, it should be screened where it is stored, to prevent the breeding of flies, which breed more in manure than anywhere else, and which carry disease.

When by one of these means, or all of them, one has got a soil rich in humus, one may know it by its look. Such soil is dark brown, rather full of little separate fibers, crumbly, and even rich to the touch. It has not the smoothness of the clayey soil, nor the grit of the sandy one. It can be pressed into a ball when moist, but readily separates again. The gardener ought to know the look and feel of good garden soil, and work to get it.

Review Questions

1. Explain the value of humus.
2. What is green manuring? What plants are best for it, and why?
3. What is compost? Explain its value and use.
4. What is manure? In what condition is it best for the gardener's use? How may such manure be supplied? Why is it made so carefully?

CHAPTER XV

The Kinds of Plants

We have now got so far with the study of plants that we understand how they grow, and what they need to grow upon. Winter is passing, and it is time to order our seeds. For seeds should be ordered early, if we do not wish to take the risk of delay by ordering later, at the "rush" season. We need to test the seed, and to be ready, also, to start indoors certain plants which are worth such care. And now, in order to understand just how to plan the work of the whole summer, we need to take a general look ahead.

We know that, besides plant food, the two greatest needs of plants are warmth and moisture. The house-plants which our mothers and our teachers grow for their pleasure depend on these. A large part of the work of tending house-plants lies in giving just enough water, and in seeing that the plants have about the right temperature. The greenhouse-man, with plants that are well started, merely does the same. But the man with two greenhouses is likely to keep them at different temperatures, in order to suit the plants which like a cooler or a warmer air. Violets and lettuce prefer a cool house, geraniums and cucumbers a hot one. And the reason for this has much to do with the whole management of a garden.

In winter the ground is frozen. Try to thrust into it the point of your umbrella: you cannot do it. For two or three, and in places for four or five, feet, according to the severity of

the climate, the frost has made the ground solid. But in the spring the ground thaws; as gardeners say, the frost comes out. At first the soil is very wet and cold; but presently it dries and warms enough for the planting of seed.

Now follows a period which we need to understand clearly. It is spring; and for the gardener the great difference between spring and summer is that frosts may come at night. They are to be expected, and since a heavy enough frost will kill certain plants, such plants should not be sowed until the danger of frosts is past. These plants are called tender.

FIG. 60. — Muskmelon, a tender annual vegetable. Frost easily kills this plant.

But there are other plants which will stand frosts, even when they are young. These are called hardy. There is naturally another class, a small one, called half-hardy, which will stand light frosts; but on the whole all garden plants are divided into the two classes of hardy and tender plants. The hardy plants may be planted in spring. The tender plants cannot safely be planted until summer.

Since I am discussing plants in groups, let me speak of two more ways of classifying them. One depends upon the length of a plant's life. Some plants sprout, grow, make seed, and die, all in the same year. Such are asters and tomatoes. They are annual plants. Others will make seed for several years in succession before they die. Peonies and asparagus

are in this class. They are called perennial plants. Some few plants live but two years, and are called biennial plants. Perennial plants from the tropical regions, as they will be killed by frost in the north, must here be grown as annuals, if they are to be grown at all.

The other classification depends upon the stems of the perennial plants. If they are soft and juicy, so that they are killed by the winter cold and die to the ground, even though the roots live on, then the plants are called herbaceous. Such are the larkspur and rhubarb. If the stems are hard, and live through the winter, they are called woody. Such are all shrubs and trees.

FIG. 61. — Lettuce, a hardy annual vegetable, will withstand frost.

These classes of plants are easily understood, though their names may be hard to memorize at first. But every new subject has its special words which must be learned. And if we are to understand about a plant, we need to know whether it is hardy or tender, annual or perennial, herbaceous or woody.

As now we face the beginning of the garden season, we see first a period in which it will pay to start plants in the house, during which they will grow to such a size that they can finally be set outdoors, and will then yield quickly.

During this period we are likely to start the hardy plants first, because they can first be set outdoors. We start the tender plants later, because they must later be set outdoors.

We can vary this if we please; the greenhouseman, with his sunlight and special heat, may do with plants almost whatever he wishes. But generally it is troublesome to grow large plants in the house, so that we seldom wish to keep them in the house more than a month or six weeks after sowing.

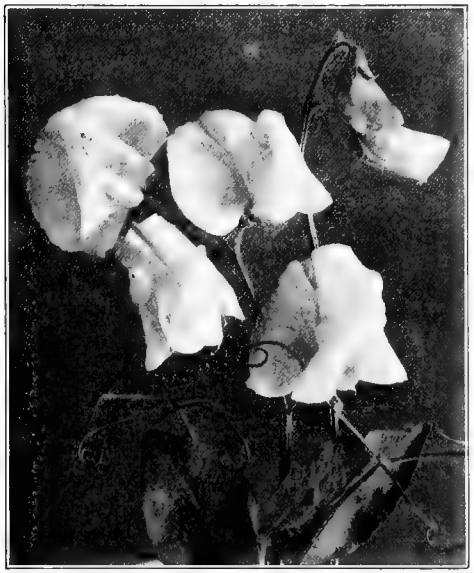

Fig. 62. — Sweet pea, a hardy annual.

The next period is one during which we can start plants out of doors, but under glass protectors called frames. These protect the plants from the killing frosts.

Then comes the time when it is safe to sow hardy plants out of doors. They will probably do well.

Finally comes summer, when tender plants may be sown without risk. Of course a freakish season may give a summer frost, but this is very rare.

It is hard to set dates for these periods. The farther south, or the nearer the ocean, the earlier they come. One year may vary from another by a week or more. Generally speaking, at the latitude of New York City the third week in April may see the beginning of outdoor planting, the last

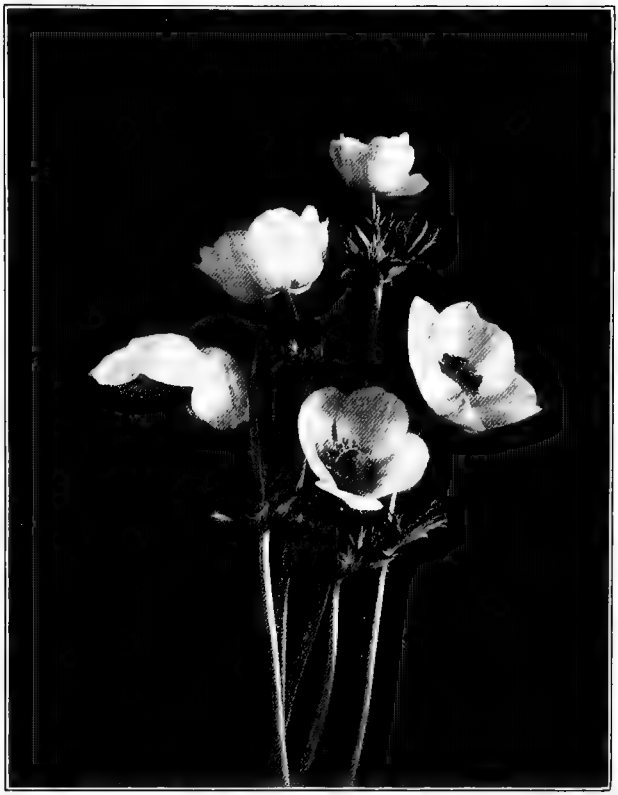

FIG. 63. — Japanese anemone, a hardy perennial.

week in May the sowing of tender plants. South of this the seasons come about a week earlier for every hundred miles; north of New York a hundred miles will mean about a week later.

When now we come to inquire which plants are worth the bother of planting in the house, and nursing for a month

or six weeks before we set them out, we shall find that only certain ones will pay us. Peas and beans, carrots and turnips, and most vegetables which are planted closely in rows, are plainly too much trouble. But lettuce and tomatoes, and many if not most of the flowers, will repay our starting them in this way. Some, however, are harder to grow than others, and especially for beginners. I should advise the following:

Flowers. *Hardy.* Calendula,[1] candytuft, coreopsis, forget-me-not, marigold,[1] pink, Drummond phlox, stock, verbena, zinnia.

Half-hardy. Aster, salvia, snapdragon.

Tender. Balsam, cosmos, godetia, petunia.

Vegetables. *Hardy.* Lettuce, cabbage, cauliflower, celery, onion, parsley.

Tender. The squash family, eggplant, pepper, tomato.

These two short lists will give any one plenty of work to do in raising plants for early yields of flowers or vegetables.

Review Questions

1. Why is it wise to order seeds early?
2. What is meant by the "thawing" of the ground in spring?
3. What for the gardener is the great difference between spring and summer?
4. What are the three classifications of plants? According to what are these classifications made? What classes did we test in an experiment with sprouting seeds?
5. Why do we start plants in the house? Out of doors under glass?

[1] These flowers should be transplanted into pots.

General Review Questions

1. What is a cotyledon? A plumule? A caulicle?
2. Describe a seed-tester.
3. Why is the best the cheapest in seeds? In fertilizers?
4. Explain how a plant gets food from the ground.
5. What does a leaf do with the food that comes from the roots?
6. Describe various ways of growing plants.
7. What is the earliest loam? If soil holds water poorly, how can it be improved? How can a soil be kept from puddling? How sweetened if it is sour?
8. Tell how to prevent soil from drying out on top.
9. What chemical elements do we supply in fertilizers? What special one do the legumes put in the ground? Which one do plants take from the air?
10. What is humus, and by what means do you intend to increase it in your soil?
11. What are hardy plants? Tender plants?
12. What is a herbaceous perennial?
13. How can you lengthen your garden season?

SECTION III

GARDENING UNDER GLASS

CHAPTER XVI

The Flats

We have now come to the time, from February to early April according to our latitude (at any rate, five or six weeks before we can safely plant hardy seeds out of doors), when we should begin raising plants for the garden plot, in order to prolong the season. By providing, indoors, with as much sunlight as possible, an artificial climate in which the plants can make a good start, we shall get our results long before the gardener who does not begin until the frost is out of the ground.

For our work we must provide, as nearly as we can in an ordinary house, the conveniences which the florist has in his greenhouse. Of course our space is less than his, for we shall have but a few window sills on which to expose our plants to the sun. But we can make the space as large as possible by putting tables close to the glass, or by building shelves to widen the sills. If these tables or shelves stand over radiators, so much the better. On them we are to place miniature garden plots, in the shape of boxes of earth. But the boxes and the earth must be carefully chosen.

Boxes are better than pots, because they grow more plants, cover more space, and dry out more slowly. They cost less, since any boy or girl can make them out of material

which can usually be had for the asking. Cigar boxes will do; the flat ones are about the right depth, and only need a few more tiny nails, so that when they are wet they will not warp apart. But they are small. I have had better success with a five-pound butter box, cut down to a depth of about two inches, measured inside. A starch box, larger still, can be cut into two boxes (or, as we had better call them, flats). And if we are strong enough to handle the weight, the very best is a soap box, because of the number of plants that it will hold. By using a saw (best a rip-saw) it can be cut into two or sometimes three flats of considerable size. Two to three inches in depth is all one needs.

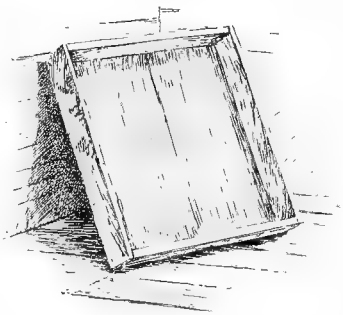

FIG. 64. — A "flat" for indoor gardening. Drainage in small flats is through cracks and loose joints.

In making the flats we must provide drainage, since we have learned that water must not stand around the roots of plants. In order to allow any extra water to escape, the boards that make the bottom of the box need not fit closely; or, if they do, holes should be bored in the bottom in several places. One way of making a well-drained soap-box flat is to have the bottom made only of well-nailed slats, with openings an inch apart. But if this is the kind of flat we use, over the slats we must put moss or excelsior, closely packed, in order that the fine soil shall not wash out. Over the holes in the other large flats should be put pieces of broken flower pots (arched over them, if curved), and around them should be packed gravel or bits of coal. In small

flats, however, we need use only coarse material of some kind or other, that will let water quickly through.

All this should be done neatly. The nails or brads that are hammered in should go straight, the sawing off of the tops of boxes should follow carefully the pencil lines that are drawn from corner to corner, the rough edges should be smoothed off with knife or plane or sandpaper. To be sure, when we have made enough flats to cover our window sill or table, we may have a mixed lot of boxes of different sizes and colors, some showing the advertising lettering of soap or starch; but we need not let this trouble us. It would, of course, be pleasant to make all our flats alike, of fresh wood; but as we shall learn before many weeks, it is not the prettiest boxes that surely grow the best plants. If we wish to be very neat, we can paint the flats.

So much for our flats and the drainage of them. Be careful about the latter, for lack of draining may spoil a good stand of seedlings. Now for the earth that we should use. If we have been careful to provide for it months ago, we shall not have to go out in the dead of winter and hack at the frozen garden. Besides, we shall have better earth, for we shall be able to make it to suit us exactly. Just what sort of earth do we need?

In potting plants and bulbs we made the earth rich and full of humus. We had it fine as well, in order to hold much moisture. Such coarse things as vegetables may have a similar soil. But for the sprouting of flower seeds we may well have the earth different: not too rich, or the plants will grow too tall and thin; not too full of humus, for much the same reason; and not too fine, for a moist soil is cold and "slow." Let us mix a soil which shall be proper for the tiny seeds of most flowers. It should be light, porous, and warm or "quick." For this mix together two parts of

loam from the garden, one part of leaf mold from the woods, and to every bushel a quart of sand. If the loam was light, omit the sand. This will give us a light, not dark-colored earth, which will not hold too much water, and which will warm quickly under the sun. The finer vegetable seeds will do well in this, also; but lettuce and all seeds of the squash family (cucumber, melon, marrows) will be glad of an extra part of fine manure. And now, when we find that our newly mixed soil is, when damp, neither soggy nor sticky, but that it can be quickly rubbed apart by the finger, we have the sort of earth that we need.

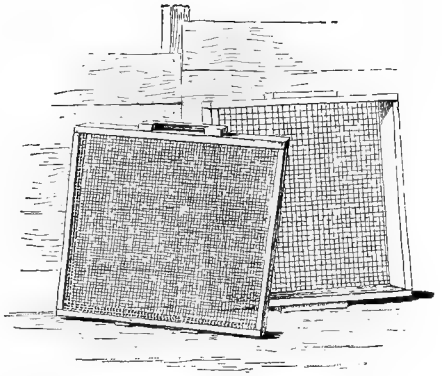

FIG. 65. — Sieves, for sifting earth, made of screening tacked over boxes.

If in mixing the soil we find that the whole, when mixed, or any part before mixing, is lumpy or coarse, we should put it through a sieve, using only that which can be easily rubbed through with the finger. For damp soil the sieve may be fairly coarse, from an eighth to a quarter of an inch in mesh. Use an ash sieve or a fry-basket. Or make your sieve, as shown in the illustration. A flour sieve is much too fine. Do not throw away the siftings; they may be used for the drainage of our flats.

The filling and watering of the flats is the next step. Take the flats, already provided with their drainage material, and with spoon or trowel fill them with earth, smoothing it

but not pressing it, until it is within half an inch of the top. Most of our seed will be small; and for them, before the seeds are in, it should be watered. If you are impatient, water it from the top. Pour the water right on from a fine watering pot, held as close as possible, if you must. Better, put a piece of sacking over the earth, fitting it closely into the corners, and then water. The earth will then not pack down too finely. Best of all, stand the flat in a pan or sink, with the water well above the bottom. It will seep into the flat and climb to the top in the course of half an hour. The earth is then thoroughly wet, without being packed at all, except by its own weight.

Now see if the level of the earth is right. In any case it has packed a little. Put a little more into the flat, leveling it carefully all around. If the flat is very shallow, raise the level to within a half inch of the top. But do not water this layer of soil. Set the flat aside to drain. By the end of another half hour, when all the water has drained away that the grains of earth will not hold, some will have climbed quite to the top. Scatter on, now, about a sixteenth of an inch of medium fine sand, and the flat is ready for the seed.[1]

Review Questions

1. What is a flat? Why is it better for raising seed than a pot?
2. Describe the making of a flat.
3. How should it be drained?
4. What earth do you recommend for flats?
5. Describe how to fill and water it.

[1] I shall advise planting seeds in sand. More of them will sprout, and since sand causes less danger of disease, more of them will live.

CHAPTER XVII

Seeding the Flats

So far we have worked without tools, and to tell the truth, of real tools we shall need almost none. We had to have a saw and a knife to make the flats; but then we were carpentering. Now that we are really gardening, we have used a trowel to fill the flats, though we could have got along without it. Put it down as a convenience, however, adding that the best trowel for flat-gardening is the small mason's trowel, flat, and diamond-shaped. The flat blade helps in smoothing the surface of the earth, and the sharp, straight point will be useful in lifting the tiny plants, a few weeks from now. Yet after all, in half an hour a clever boy or girl can make a tool that is better than anything else for the work that we are to do.

Get a piece of wood about seven inches long; a little more or less will not matter. It should be about half an

Fig. 66. — The "seed-trowel," a useful tool for flat-gardening. Any one can whittle one out of a piece of hard wood.

inch in diameter, and should best have a hard, close grain. Hard wood, while more difficult to work, will take and keep a better point and edge. I made my trowel out of the handle of a little sink-mop that was used for washing bottles. Now whittle one end into the shape of a sharpened pencil of which the lead shows for nearly an inch. Next, flatten the other

end, for perhaps two inches, into the shape of the blade of a table knife. Make the edge fairly sharp, so that it will cut into the moist earth with little disturbance of the particles. Our tool is now a kind of trowel for lifting small plants or for drawing lines in the soil, with an end that can be used for making holes for seed, or in pushing the tiny seed into place.

For smoothing the surface, a sharp-edged, straight ruler, such as any one can make, is useful. It should be almost the inner length of the shortest flat, so that it can be used in any of them. The broader it is, the better. Or a *float*, easily made of a block of wood of the proper size, with a strip tacked on to use as a handle, may be used for the same purpose.

The seed is now ready for us, having been already tested. It should be sowed in the flats so carefully that neither seed nor space is wasted. As most seedlings can be transplanted (except for those of the squashes, of which I will speak later) we may sow the seed pretty closely. Counting on some natural or accidental loss, and always expecting to give away some of the plants, we had better sow twice as many seed as we shall want plants. In gardening we should always plant too much, in order to be sure to have enough. Calculate, then, how many plants of the various kinds will be needed in the outdoor garden; multiply by two; and then see how much space will be needed in the flats. We shall sow either broadcast, scattering the seed a quarter-inch apart evenly over the whole space; or else we shall sow in rows about two inches apart, the seed a quarter inch apart in the rows. We shall find that it does not take much space in the flats to provide for a good-sized garden out of doors.

In the flats we shall cover the seed to about twice its own depth. Having decided just where the seed is to go, we

either strew it delicately broadcast, or else we prepare to sow it in rows. Laying the ruler along the line where the first row is to go, we mark it faintly in the sand by means of the blunt point of the seed trowel, or by pressing the edge of the ruler slightly into the sand. Along this line we sow the seed, either shaking it from the seed-paper or from the palm of the hand, or patiently, one by one, dropping the seed.

It is worth while to take pains with this. Use the point of the seed trowel, and whether you have sowed broadcast or in rows, push the seed into the proper spaces.

Then cover the seed. This is done by sifting over it the proper thickness of sand. Then with the ruler, or the float, press the sand snugly everywhere over the surface. This is called firming it. But with the very tiny seeds, and with the seed of celery, we simply press the seed into the sand, without covering it at all.

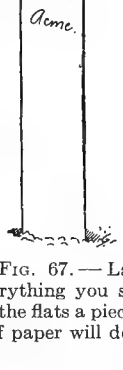

FIG. 67. — Label everything you sow. In the flats a piece of stiff paper will do.

Now we should mark the row. Get a little wooden label, a bit of cardboard, or even a slip of stiff brown paper. On it copy the name that was on the seed package: "Tomato, Stirling Castle," or "Poppy, Gaw's Victoria." Mark also the date. We need these facts so as to tell the different plants apart when they appear (for at first they will look nothing like tomatoes or poppies), and also so as to know when to expect the appearance of the seedlings. And now we are ready to plant the rest of the flats.

One kind of seed should be planted differently from all others. Members of the squash family (which besides the squashes includes the cucumber, melon, watermelon, marrows, and gourds; sometimes they are called the *cucurbits*)

very much object to having their roots disturbed. If transplanted, they either will be very slow in starting again, or will die. We must therefore plan to sow them where they are to remain; that is, they should be put into something which can be set right into the open garden.

For this a flower pot will not do, as it has but a small hole in the bottom for the roots to escape by. We might try to take the ball of earth out of the pot, yet there is much danger

FIG. 68. — Melon plants in two- and three-inch pots, and on old sod. The sod is better. These all need thinning to one plant.

of disturbing the roots; for these great hairy things, if once they get to the pot (and get there they will, if they can) cling so firmly to the earthenware that it is difficult to dislodge them without injury. After a few experiments, therefore, I have not used pots for cucurbits any more. Some persons take an old sod, turn it upside down, and, scooping out the center, put in good planting earth. Or some take an old tomato can, with neither top nor bottom, fill it with earth, and put in the seed. In this case a trowel or thin board must be slipped under the can whenever it is moved.

For my part I prefer a strawberry box. The wide cracks at the corners allow drainage, and the bottom allows the box to be moved freely. Then when it is time to set the plant out of doors, the bottom of the box can be cut away, and the roots allowed to strike deep into the ground.

Seeds of the squashes may be covered as deep as a quarter or half of an inch. Make a little hole with the finger, put in the seed, with the point down, and cover with earth. Or thrust the seed straight down into the soil for the distance of its own length, and fill with earth the hole that the fingers have made. Plant three near the center of each box, an inch from each other. Label, and then treat like the other flats.

If the flats have been seeded soon after watering, they will not need to be watered for some time. But if from the appearance of the soil they are too dry (we can tell by the color, or the feel), they should be watered again. Now that the seeds are in, the watering should be especially careful. Use if you must a watering-pot with very small holes, holding it close to the flat. Better still, lay cloth (sacking or a double thickness of cheese-cloth will do) over the earth before watering. Best of all is to set the flat in a pan of water, allowing this to seep up from below.

When the flat is thoroughly watered, you will see the moisture shining on the surface. If you touch the soil with your finger, a little puddle quickly gathers. Now set the flat away to drain. Put it in another pan, or have sand strewed over your shelf or table to catch the moisture.

The seeds now want two things besides moisture: darkness and heat. Darkness is given by the covering of soil; but we may make the flat darker still, and at the same time prevent the surface from drying, by putting a little board over the flat. This will do very well if we get our heat

from a radiator, on which we may set the flats. But if we mean, like outdoor gardeners, to use the heat of the sun, we had best put a sheet of glass (old camera plates will do; they can be very easily washed) loosely over the flat when we set it in the sun. Moisture from the earth will stand in drops on the bottom of the glass, and the climate below will be tropical. But it must not be too tropical; lift one edge a little, by means of a splinter of wood placed under it.

Watch the flats now daily, several times daily. If the surface of earth cakes, or becomes dry, water it again. But we may need but one watering, or none at all, if only we have coverings loosely fitted over the flats.

Review Questions

1. What sort of a trowel do you propose to use?
2. What is broadcast sowing?
3. Describe the sowing of a row of seed. With what should it be covered?
4. Should all seeds be covered?
5. What plants do not transplant well? How should they be handled?
6. How may the sprouting of seeds in a flat be hastened?

CHAPTER XVIII

The Seedlings, Indoors

We are watching for the appearance of our seedlings, and now the dates written on our labels will keep us from undue worry. Some seeds sprout much quicker than others. Radish is quicker than most vegetables, requiring frequently but three days. Do not be troubled, however, unless they do not appear for a week. On the other hand, you need not expect to see your celery seedlings for ten days, while they may not raise their heads for twenty. Flower seeds vary quite as widely as this. If you had soaked them first, they would have "come" the quicker.

In any case, the time is likely to seem too long. Yet at last we see the tiny irregular crack appearing along the line of the drill, and soon the seedlings begin to show. They come in odd forms: the onion thrusts forth an elbow, the tomato two little leaves, the carrot tiny spears like blades of grass. Other seedlings take other forms — but at any rate, here they are, and now we must care for them.

As soon as the first crack in the soil appears, the cover should be taken from the flat, and the flat brought to the light. If left in the dark, the seedlings will be pale and spindly, reaching eagerly toward the cracks where light enters. If left covered with glass, the tropical climate, so good for the sprouting of the seeds, is very likely to cause the little plants to be soft and feeble.

And now that the plants are up, we may well allow the surface of the soil, which we have carefully kept moist, to dry out a little. This is because of a disease which florists all dread. It is called "damping-off," and cuts down the little plants suddenly. Too much moisture causes it, or crowding — and here is one reason why I advised so much space for each seed. So let the surface dry a little; and then, that it may not dry too much, make a mulch by scratching the dry soil. If you wish to do this quickly, an old table fork will serve; but the work may be done with the sharp end of the seed-trowel. And in case you have not been able to plant in sand, do not be alarmed when the surface now looks dusty. If you have done the work properly, on drawing the dust away the moist soil will quickly show.

We must, however, water the soil at proper times. This depends on the quickness with which our particular mixture of earth will dry out; and it depends as well on the size and depth of the flats. Speaking generally, I should say that every other day is often enough to water. But every gardener will have to find this out for himself — with this warning, that the larger the plants grow, the oftener will water have to be given.

To watch the growth is a great pleasure. The seed-leaves, which first appear, turn green, spread out, and produce at their joining a little knob which soon proves to be the beginning of the stem, with its first pair of true leaves. Once every few days we turn the flats half round so that the plants shall not grow toward the sun. The stem shoots up, another pair of leaves appears, and we become aware that the little plants are beginning to crowd. If in the beginning we were generous with our seed, or, being doubtful of its strength, sowed very thickly, so that the "stand" of plants

was very thick, then they have been crowded from the beginning.

FIG. 69. — Seedlings of squash, each with one true leaf just showing. The others are cotyledons.

As soon as we see that this has happened, we should recognize the danger. If they crowd too closely, they may damp off; or in the struggle for plant food they may all grow weak and "leggy," or too tall and thin. There are now two things for the gardener to choose between. One is to transplant, the other to thin, the plants.

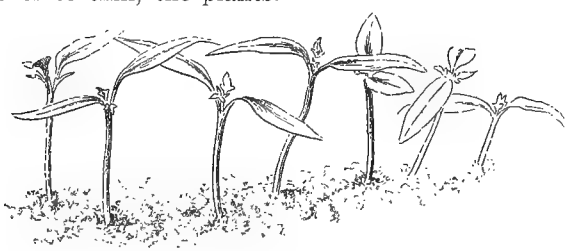

FIG. 70. — Seedlings of tomato. The first pair of true leaves is just opening out.

If the plants are crowded from the first, they must be thinned, since when so young they cannot safely be moved.

A look at the softness and delicacy of their tiny stems and roots will prove this. With much care, then, we pinch off, or twitch out, the weaker of the little plants, leaving the remainder at safe distances from each other. As this safe distance, for young plants, need be no more than a quarter inch, we see that to plant the seed at that distance is wise. It saves the early work of thinning, which is not easy, and which really disturbs somewhat the roots of the plants that remain.

At any rate, we have at last our plants with four true leaves, before the appearance of which it is not wise to transplant them. Their stems are now more fibrous, and their roots longer. They can therefore stand the moving well, and we will prepare another flat to receive them. (Pots are better for the plants, but they are expensive, and require much more room.) At the same time we water the first flat, lest the earth, if too dry, shall drop off from the roots while we are moving the plants. For the more earth we can lift with the little roots, the less the plants lose in strength.

Now, with the two flats side by side, we begin the work of transplanting. With the flat end of the seed-trowel we strike deeply around three sides of the plant which we first select; then, thrusting the little tool down the fourth side, we lift the whole plant out of the flat. This must be done carefully, while the other hand makes sure both that the top of the plant is not tangled with its neighbors and that the plant does not fall from the trowel. Without joggling, the plant is carried to the second flat, where a single thrust of the finger has made, or can now make, a hole for the roots. We pause a moment to see if the hole is deep enough. If not, we make it deeper; if too shallow, we push a little soil into the hole. Then we lower the roots into place, gather

the earth around them with the free hand, and then, laying down the trowel, with the fingers of both hands we firm the earth around the plant.

Of course the first attempt is clumsy, but we learn with practice. The operation which at first needed a couple of minutes, we presently accomplish in a few seconds. We set all the plants from the old flat into the new one, or the

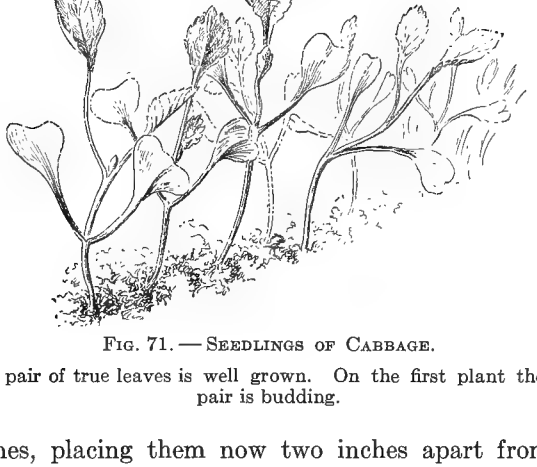

FIG. 71. — SEEDLINGS OF CABBAGE.

The first pair of true leaves is well grown. On the first plant the second pair is budding.

new ones, placing them now two inches apart from each other. When we have finished we survey the flat.

Truly, it does not look very neat. Our fingers have pinched the earth closely around the plants, so that these stand in little hillocks, with valleys in between. We must therefore take earth from the first flat and fill all hollows, making the surface even. If the soil seems dry, we may water; indeed, it is a good practice to water after transplanting, to make sure that the soil particles get close to the roots. Finally we set the flat in a shady place for the rest

of the day. The plants have each had a shock, since in spite of all our pains we must have torn away some of their fine roots. In compensation for this loss at the roots I often nip off a part of a leaf, or even a whole one. Not until the next day do I put the plants in the sun again.

It may be asked, why do we need to thin or transplant? Why not sow the seed at two-inch distances at the first, so as to save the labor and the shock to the plants? The answer is that, if not done too early or too often, transplanting is good for the plants. The little shock prepares them for the next one; and besides, they are encouraged to grow a thick mass of fibrous roots, easy to handle, rather than long wandering roots that will be injured. They are thus the better fitted to be moved again, as they must be if they are to be set outdoors.

But the cucurbits, as we have seen, must not be transplanted at all. We content ourselves by pulling out of each box all the plants except the strongest. The others we may try to save by transplanting, but we are likely to lose them.

Once the plants are safely transplanted (and for a couple of days we shall watch anxiously to see that all are doing well) we treat them much as before, with cultivating and watering. From time to time we turn a different side to the sun. If again the plants crowd they should again be transplanted, which after the first trial is now easy. It is not difficult to handle plants; even the least experienced, if only he is interested, can learn to manage them. The pleasure in watching the little things grow strong under his care I will leave the reader to find out for himself.

Review Questions

1. Describe, from your experience, the appearance of seedlings.
2. What is damping off, and what cure is there for it?
3. What should be done when the plants crowd?
4. How do you know when a plant may safely be transplanted?
5. Describe your method of transplanting.
6. Does transplanting not harm the plants?

CHAPTER XIX

Potting

We must know how to pot plants and cuttings, even though we shall use pots as little as we can. Pots are expensive, they take up more room than flats, and they are more troublesome to handle. Pots dry out more quickly than flats, and so have to be watched more carefully. Nevertheless, they have certain very great advantages. Plants in pots do not have to struggle with their neighbors, and thus can more quickly grow large and strong. When plants grow too big for their pots, they can be repotted without the slightest injury to their roots, and do not have to wait to recover. Cuttings, after they are once started, always do better in pots than in flats. Therefore, although for most of the time we shall use flats, yet for plants which are delicate, or in which we are specially interested, we shall use pots.

In buying pots we should take care to get them well made and uniform. They should "nest" well; that is, when empty they should fit snugly into each other. Those are stronger which have a thickened rim. For ordinary plants the deep or so-called standard pots are best; for bulbs, except for lilies and gladioli, use the shallower bulb pans. For our present purpose, raising seedlings to set out of doors, two-inch, three-inch, and perhaps four-inch pots are the sizes that we shall need. The two- and three-inch pots will need only a crock (a piece of broken pot) or a stone, over the hole

in the bottom, to assist drainage; the four-inch pots will need a little coarse material as well.

Nothing else does quite so well as these terra-cotta pots. Nevertheless, other things may be used. Strawberry boxes, for example, will do nicely, though they are large and clumsy. Tin cans, with holes punched in the bottom for drainage, are very serviceable. But from these we cannot repot nicely. Best of all the cheap materials are the pots made

FIG. 72. — "Standard" pots, with a rose pot at the end of the row. Pots with thick rims are best for general use.

of heavy paper. Though they do not protect the plants as well as any of the others, they may be bought cheaply by the dozen or hundred, and on account of their shape can easily be used for repotting. Or with a little skill, such pots can be made of building paper.

I shall suppose that we are potting seedlings from the flats. The same mixture of soil should be used. We should begin the work of potting by scrubbing the two-inch pots inside and out. This is neater, and it is better for the plant to have clean porous pots. The process of washing also wets the pots thoroughly; but if they do not need washing they should be put under water for at least a few minutes, so that they shall not steal water from the plants.

Drain them, now; and having studied our plants to see how long the roots are, put in such a thickness of soil as the

roots can just reach to, remembering that the surface is to be half an inch below the top of the pot. Now lift the plant, hold it in the middle of the pot with one hand, and with the other pour in soil all around it, firming it around the sides of the pot with the fingers or a little stick. Put in more and more until the roots are firmly held; then press together, at the very base of the little plant, enough earth to hold it upright. Level the surface, using more soil if necessary; tap the pot smartly on the desk or table, to settle the earth in place, or press down with the thumbs, water freely but gently, and the work is done.

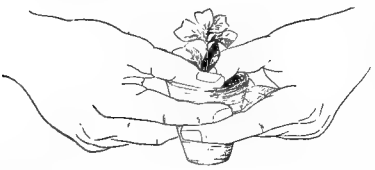

FIG. 73. — Using the thumbs to finish the potting of a plant.

If you have done this properly, the plant is now in the pot with the earth not too firmly pressed around it. If it is jammed or rammed in with too much vigor, the roots cannot easily spread out.

Another way to pot the plant, and quite as good, is to drain the pot and fill it loosely with earth quite to the top. Tap it lightly, to settle the earth a little. Then with the finger make a hole in the center to the right depth, lower in the plant, press the earth around the roots, firm it around the base of the stem, and scatter in a little more earth, leveling the surface. If you have calculated rightly, and have not pressed the soil down too hard, you will have both earth and plant at the right depth.

Cuttings are to be potted just as plants are, except that the larger ones may need larger pots.

Put the plants always in the center of the pot. They can thus grow more evenly.

Now treat the pots as you have been treating the flats. The easiest way of handling them, by the way, is to stand them in a flat or a pan, with moss around them. This, if kept wet, prevents the pots from quickly drying. Let the pots dry out a little on top, make the earth loose, and do not water again until you find that the soil beneath is also drying out. Then water generously, as before. And lest the plants should grow one-sided by reaching toward the light, every few days turn the flat about, or else give each pot a half turn.

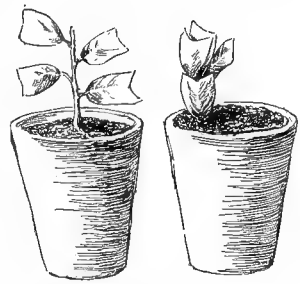

FIG. 74. — POTTED CUTTINGS. Set the plant always in the center of the pot.

Treated thus, the plants will grow quickly, and you will soon begin to wonder if the pots are not too small for them. You can easily find out. Take one of them soon after it is watered — not when the soil is dry, or the earth may crumble away. Hold the pot in one hand, with two fingers across the top, one on either side of the stem of the plant. Turn the pot upside down, and rap on the bottom with the knuckles of the other hand, or with a knife-handle. The ball of earth should drop lightly against the fingers, the pot can be lifted away, and you can examine the roots. If a good many of them have pushed through the earth, and are coiling against the bottom and sides,

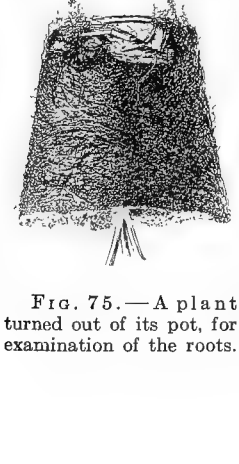

FIG. 75. — A plant turned out of its pot, for examination of the roots.

then the plant is crowding, and should be given more space. If you see only a few roots, or none at all, put the plant back again and wait a few more days.

If the plant does not easily slip out of the pot, as described, strike the edge of the pot, while it is upside down, against the table.

When you have decided that your plants are ready for repotting, prepare enough pots of the next size larger. Do not take four-inch pots when three-inch ones will do: if you follow this direction, the plants will thrive better. Wash the pots as before, put in coarse material for drainage, and now put in a layer of lightly packed earth of such thickness that when the ball of earth from the first pot is resting in the second, the surface will come about as before, half an inch from the top. This will require good judgment.

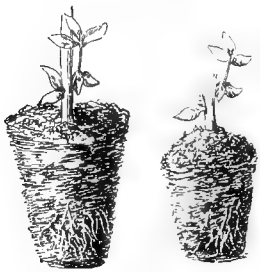

FIG. 76. — A plant as taken from its pot, and as prepared for repotting.

Now take from its pot a plant which, half an hour ago, you have well watered. The white roots (they should never be left so long as to become brown and woody) are curling tightly near the bottom. Loosen them a little with the point of your seed-trowel. If they are clinging to any of the drainage material, brush it away. Now from the top and sides of the ball of earth, using fingers or seed-trowel, break away some of the earth. Do not injure the roots in doing this. Lower the ball, now, into the middle of the three-inch pot, and put in earth all around it, packing it with the fingers, and making sure that nowhere, especially at the bottom, shall there be any empty spaces. Fill in now on top till the plant stands at the right depth, and

water it. You will soon learn to do this work quickly and neatly.

And so, as the plants grow, you can move them from pot to pot, always using but a single size larger. The method is always the same. Have the new pot clean, damp, and well drained, and holding enough fresh soil to keep the plant at the proper depth. Loosen the roots when you take the plant from the old pot; break away as much of the old earth as you can, and repot in the middle of the new pot. Have no air spaces under or around the plant, yet do not pack the earth so hard that the roots cannot easily grow. Then set in the sun. Turn the plants every few days. If the plant is growing slowly, and seems stunted, feed and water freely; but on the other hand, if the plant is growing tall and looks pale and soft, feed and water less. Such plants may well have their tops nipped back.

Watering of pots is usually done from the top. If you have an ordinary watering can, take off the sprinkler, so as to direct the water at the pot, instead of pouring it everywhere. Better still is a can with a narrow nose, which can be thrust among the plants without hurting them. Take pains not to direct the water with such force at one particular place that the earth is washed away. Instead, distribute the water gently over the surface until it stands in a little pool all around the plant. You will soon learn how much is proper to give, by watching to see how much moisture drains out below. If just a few drops trickle out, you have given exactly enough.

But there is another method of watering, just as there was with flats. Stand the pots in pans, and then pour in a couple of inches of water. The water should reach higher than the drainage material in the bottoms of the pots. When it reaches the fine earth it will climb, by capillary

attraction, quite to the surface, where it can be seen shining. The plants should then be promptly removed from the water, and set in their places to drain. This is, of course, a more troublesome method than the first, and is likely to give the plants, for a few minutes, more water than they really need. But it makes sure that they have enough.

If you follow these directions carefully you will have, before long, a group of sturdy plants ready for the garden.

Review Questions

1. Explain the advantages of pots used for seedlings.
2. Describe various substitutes.
3. Explain your system of potting. Of repotting.
4. How can pots be easily watered?

CHAPTER XX

The House-plants

The plants of which so far we have been speaking are seedlings or cuttings, mostly destined for the garden. I wish to stop long enough, however, to speak of house-plants, which are to be taken out of doors only for their summer's rest. In many ways they should be treated differently from the plants which we have just been studying.

In the first place, the purpose of our house-plants is different: usually we wish them to flower, not to grow large. And so the repotting stops as soon as possible, say at five- or six- or seven-inch pots. We are then willing to keep them longer in the same pots, in the hope that they will stop their growth and begin to flower. Do not repot a house-plant, then, unless you are sure that the roots and the plant are suffering for more room or fresher earth. Even then the plant may flower better if you take it out, shake off some or even all of the soil (in the latter case wash the roots) and pot it afresh in the same pot. Study again Figures 22 to 25.

In the second place, the potting-earth may very well be different. Mix equal parts of good loam and well-rotted manure, and with them put a little (say a third as much as of the others) of leaf mold. The manure should be very well rotted, and is best a mixture of horse and cow manure. This mixture may vary a little: to every bushel add a quart of sand, if you wish the plants to grow more slowly; but for strong growth add bone-meal instead. Put a few small bits

of charcoal in the soil, and with the drainage material mix larger pieces.

Next, the plants should be watered according to their season. When they are flowering, water freely; when they are not (they are then said to be resting), give much less. Remember, also, to watch the plants on very sunny days. Through the winter the sun streams in the windows almost directly on the plants, and in spring and fall is often especially hot. Do not let the plants dry out too much.

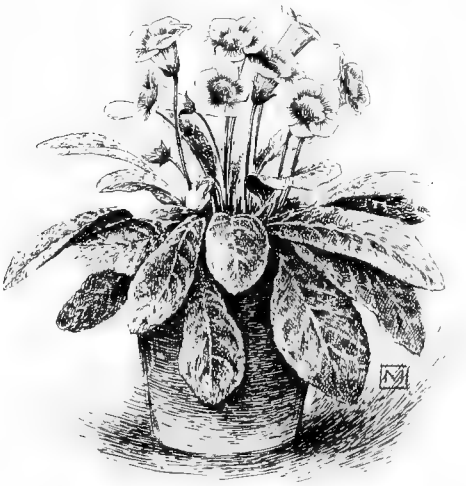

FIG. 77. — A house-plant. Gloxinia.

On account of this very hot sun, again, be careful not to wet the leaves when the sun is directly on them. They may then burn and shrivel.

Fertilizers are likewise different. Instead of nitrate of soda or liquid manure for rapid leaf growth (they may of course be applied whenever the plant looks sickly) bone dust, which is finer than bone-meal, may be mixed with the top soil, half a teaspoonful at a time. For coaxing plants to flower, you can buy at the florists' various mixtures, which are usually good. Apply carefully according to directions, and be sure not to give too much.

We shall still turn the plants every few days, to keep them growing evenly; but with these older plants we shall have more to do. If a leaf withers, we pick it off; and whenever a blossom fades, we make sure to nip it before the plant begins to form seed. When plants make seed, they stop flowering. If the leaves are dusty, we wipe them with a soft, damp rag. And with these house-plants we study, also, the general shape. If the plant is growing one-sided, we cut out leaves, or even branches, from one part, in order to help the other. And if the plant grows too tall, we cut it back, so as to encourage buds to start lower down. It is a mistake to let house-plants, and especially geraniums, grow too gawky. Beautiful flowers will not hide the ungainliness.

Sometimes, when we discover that a plant is yellowish and sickly, we have cause to worry. First we question if it has had sun enough, or even perhaps too much. We ask if the room has been allowed to grow too cold at night. The room should not be colder than about fifty degrees — nor should it, by the way, get so high as eighty degrees for the ordinary plants Drafts of cold air are often as bad for plants as a cold room. If air is introduced (and the room should always be fresh), it should not be by air blowing directly on the plants. The air should be moist, and that is why plants often suffer in hot-air or steam-heated houses — the air is dry. It can be made moister by standing dishes of water on the radiator, or by hanging little pails in the register. Gas, from the gas-jet or the furnace, will quickly injure plants.

If none of these causes have brought about the injury, we must look for some enemy or a disease.

Enemies, of course, are insects, and the first of them is the aphis — a soft-bodied little thing of different colors. Wipe off his colonies with a soapy rag, but best spray the plant

with any of several mixtures which you can buy at the stores. Aphine is well recommended. Or construct a box into which you can put the plant, burn in it some tobacco — stems are good enough for the purpose; the florist sells them — and leave the plant covered for four or five hours.

This last remedy is also good for red spider, the second serious pest. He is a tiny red or brown dot seen working on the under side of the leaves. He can be washed away by cold water squirted against the leaves with as much force as possible. Turn the plant upside down under a tall faucet, or spray from a rubber bulb which can be bought at the drug store. Or again, dip the whole top of the plant into water which is a little hotter than you like to put your hand into; at about 150 degrees. Do this quickly three times.

The mealy bug looks like little tufts of cotton. Wipe him off with a soapy rag.

Diseases are luckily very few. Fungus makes the leaves turn to a black powder. To stop it, spray it with Bordeaux mixture. For house-plants this can be bought in convenient form at the seedsman's. Follow the directions on the box or can.

Mildew covers the leaves with a whitish powder, which makes them curl. Moisten the leaves, and dust thoroughly with flowers of sulphur.

And always, whether or not the plants are sickly, water and feed them well, keep the temperature right, and the air moist.

Review Questions

1. Why do we not put house-plants in as large pots as possible?
2. How much water do you give a flowering plant? A resting plant?
3. Why should plants be turned every few days?

4. How should a house-plant be pruned?

5. Should air for house-plants be dry or moist? How can it be made so?

6. What is the aphis? The mealy bug? The red spider? How are they killed?

7. How would you treat fungus and mildew?

CHAPTER XXI

Hot-beds and Cold-frames

Pleasant as is the work of gardening in flats in our windows, we are sure to find the space rather small. The first flat overflows into others; or we become ambitious, and we desire more plants. But still, outdoors, winter lingers in the frozen ground, and to grow plants there is impossible. We know how the greenhouseman meets the problem, and we have been trying to imitate him. Puzzling how we may gain a little more room, we come to the idea of using window sashes, or something like them, held up on frames outdoors, to give us garden space. Under them the cold air cannot well penetrate; we can close them at night and open them when the sun is warm, and the plants should thrive.

The idea is a good one, and this device is used by many people. One drawback is, however, that we cannot begin to use frames until the frost is everywhere pretty well out of the ground. For though by putting the frames and sash on the frozen ground we can thaw it out directly below the glass, the frost all around will keep the ground so cold that seeds will scarcely sprout. And if we wait until the frost is nearly gone, we are well behind the season of the greenhouseman, or even behind those who raise their plants in windows. How can we make the outdoor soil warm enough for gardening in March, or even perhaps in February?

Rich folk do it by putting under the sash, in the soil, pipes carrying hot water or steam. We shall do it another

way. Fresh horse manure, as we know, will heat when packed together; it will even burn out in a short time, leaving itself white and cold. But by mixing with it a proper amount of straw it will not get so hot, yet will last much longer. Thus by putting some of this manure under the soil in our frames, we can get and keep the right temperature.

Such an arrangement of manure, soil, frame, and sash, is called a hot-bed. Used without the manure, the frame and sash are called a cold-frame. The hot-bed may be planted even as early as February, the cold-frame not until a month or more later.

Hot-beds can be used in two ways. Either we can spread the hot manure right on the frozen ground, and having packed it in a bed at least eighteen inches thick, we can put our frame and soil on that; or we can dig a hole in the ground and pack the manure in, and then fit the frame snugly around the upper part of the hole. The first way wastes heat, for much of the warmth must go to thawing the frozen ground below, and some escapes into the air. Besides, it takes more manure, for the bed must be very thick, and it also must be spread out at least a foot longer and wider than the frame. If the manure is put into the ground, not so much is needed; and if surrounded by wood, which will keep the sides of the hole from crumbling, not so much of the heat escapes. Let us suppose that this best way is the one that we shall follow.

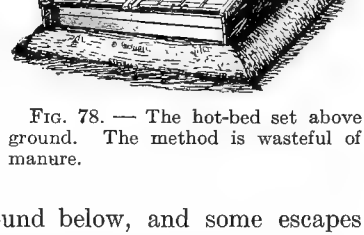

FIG. 78. — The hot-bed set above ground. The method is wasteful of manure.

First let us settle the size of our frame. This may be decided by the size of the place where we must put the

frame, or by the size and number of the old window sash, such as storm windows, which we may happen to have at

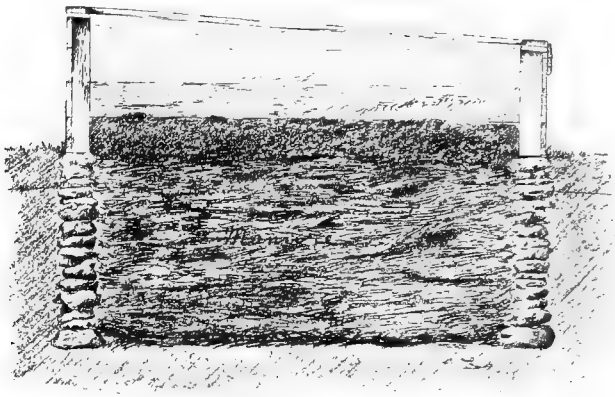

FIG. 79. — A sunk hot-bed, with a permanent pit made of stone. Such a hot-bed is the most effective.

our disposal. On the other hand, we may buy the sash outright. Dealers usually supply them in two sizes, three

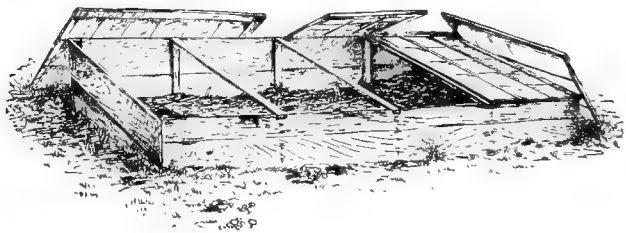

FIG. 80. — A four-sash standard frame, six feet by twelve.

feet by six (the standard size) or about three feet square (called pony or junior sash). The latter are better for small folk, as it is hard work reaching into the middle of a frame that is six feet from front to back.

Maybe you will make your sash yourself. In that case notice that window sash and garden sash are differently made. Both can be used for our purpose; but if you must buy, or if you intend to make, have the true garden sash. It takes less wood and less carpentering, and sheds the rain

FIG. 81. — HOME-MADE SINGLE-SASH FRAMES, TO FIT OLD STORM WINDOWS. These frames, made of old lumber, have lasted for years, and are enough to supply a garden 100 ft. square with transplanted vegetables.

better. Then plan your frame according to the measurement of the number of sash that you intend to put side by side.

Before winter comes, if we are wise, we make our pit and line it with wood. For this purpose we make a sub-frame, just the size of the upper one and eighteen inches deep, or deeper still if we intend to use much manure. Thirty inches is the deepest needed. The lumber may be rough, unless we intend to paint it: smooth wood requires less paint. I

should advise its being made of either cypress, chestnut, or hemlock, the woods which last best under ground. The wood should be two inches thick if we can afford it, but all this depends on how much we are willing to pay. If there are old boards at hand, of any kind or thickness, we may well make the sub-frame, and the top-frame as well, of these, and save up for the time when we may have to replace them. Fasten the sub-frame at the corners (if bolted, it can more easily be taken apart) to stout joists which extend a few inches higher. These corner posts will keep the upper frame in place. Sink the sub-frame with its top on a level with the ground.

But where shall we place it? For convenience, of course, near the house. It should, however, have full sunshine for as much of the day as possible, and so should be on the southerly side of the house, with no trees overhanging. Do not put the frame snug against the house if you can help it: the drip from the eaves is troublesome; and again, you will often wish to get at the plants from behind. Face the frame squarely to the south (if you vary this at all, it must be only a little toward the east) so that the sash shall get the sun properly. But though there is to be nothing between the frame and the sun, there ought to be a protection between it and the wind. On the northerly or northwesterly sides, or both, secure a windbreak if you can. It may be the house, or a fence, or even evergreens cut and set in the ground. This will keep out the wind, and catch and hold the sun in a warm place.

Before winter, also, we decide upon our soil. Best is a mixture of equal parts of leaf-mold, well-rotted manure (horse and cow manure in equal parts, if possible), and good garden loam, with a shovelful of sand for every barrow-load of the mixture. The result, a medium earth that

crumbles easily even when moist, will both warm quickly and hold its moisture. If you find that you have just this sort of thing in the garden, you will not need to specially mix it. Store from frost enough of it to make a layer six to nine inches in depth over the whole of your frame. You may wheel it into the cellar, or you may even store it in the sub-frame, if you cover deeply enough with hay or leaves to keep out the frost.

And having done all this, you can, at your leisure, while the winter progresses, prepare the frame. Unless it is a very small one, make it so that it can be taken apart. Besides this, I need to tell you only two things. First, the front should be lower than the back by about one-half. Standard frames are sixteen inches high at the back and eight inches in front. Pony frames measure about twelve and six inches. The smaller the frames the lower they should be, in order to get the sun to as many square inches of soil as possible. Secondly, there should be a "rafter," running from front to back of the frame, between every two sash. For while the frame can, of course, hold as many sash, side by side, as we please, these openings let in the cold and the rain. Each rafter, then, and each end-piece supports the edge of the sash from beneath, and fits close along its side; besides, each supporting strip is grooved to carry away the rain. The rafter should be loose in its place, or fastened lightly in, so that it can be lifted out to permit working inside the frame.

Let us study, for a moment, one further problem. When the day is fine and sunny, it will be warm inside the frame. But the nights will always be colder, and many days in February and March will be bitterly cold and stormy. A single sheet of glass will not keep the plants secure against the cold. What can we do in such a case?

Some people use a sash with a double layer of glass. It has two great advantages. In the first place it admits light,

which the plants need, from the earliest to the last gleam of day. In the second place, while the sash are of course heavier and harder to handle, their management is simple. But many people have not yet come to use them, and those in very cold places doubt if even two layers of glass are enough to keep out the cold. Instead, the common thing is to use mats and shutters.

Mats were formerly made of straw, tied together by string; but nowadays it is well understood that mats made of cloth are easier to handle, lie closer, and last longer. An old quilt is excellent. Or any one can make mats at home, of clean sacks quilted together.

Shutters are quite as much to keep the mats in place as to help against the cold. There should be one to each sash, tightly jointed—if possible of matched boards. But as they are clumsy at best they should also be as light as possible. Make them of half-inch boards, held together by cross pieces.

And so we are equipped with all our material, and can look eagerly for the coming of the first hint of spring.

Review Questions

1. What is a hot-bed? A cold-frame? Explain the value of the rafters, and how they should be made.
2. How do you propose to heat your hot-bed?
3. What size frame do you propose to use? What kind of sash? Where will you put it?
4. What windbreak have you? What covers?

CHAPTER XXII

The Management of Frames

There are in spring two periods which every gardener should learn to know. They vary from place to place, according to the distance from the sea, or the height above it, but chiefly according to latitude. The farther north we are, the later comes the spring, with the two periods of which I speak. These are the times when the ground is fit for planting, and when frosts are over for the year. I have mentioned them already; just now we need know only the first in order to calculate when to start our hot-bed. Old gardeners in every town know the average season very well, and we can find out from them.

Four to six weeks before this time we may start the hot-bed. First we order the manure. It should be horse manure only, and from horses that have been well fed with grain. You must calculate the amount that you want, according to the size of your frame. A two-horse load, "with the side-boards on" (for manure does not pack very closely, and is lighter than earth), will when well tramped give enough for a layer a foot thick in a frame for three pony sash — three feet by nine. Should you need a thicker layer (as you will if you start the bed six weeks ahead of planting time, instead of a month), you must buy more manure. If you make the bed on the surface of the ground, it should be eighteen inches deep and a foot larger than the frame each way — more manure still. Examine the manure carefully

when it is delivered. It should be so fresh as to be already steaming, and should contain only a third of the bedding material, which is best of straw. It is not so good, if of leaves; and it should never, for our purpose, be of sawdust.

Pack the manure in a thick bed about two feet deep. It may be left on the surface of the ground, or may be put in the frame. Leave it for two or three days, and then fork it over, putting in the middle what was first on the outside. By this time the first heat of the manure, which was more than we need, has gone, and we can at this second handling safely pack it inside the frame, treading it down in layers of three or four inches, watering each one when packed. With a thermometer made for the purpose, or with an ordinary thermometer very carefully used, so as not to break it, daily test the heat of the bed. When it approaches ninety degrees, it is safe to put in the soil.

The earth may be from six to nine inches deep over the manure, and when leveled, should come to about the surface of the ground. Put on your frame now, carefully bolting it in place. Sift in, finally, a last layer of soil, making it perfectly smooth. Now put in your rafters, unless you think they will be in your way when seeding. Some people find them useful at that time.

Sow your seed next, just as if you were sowing them in flats, but more thickly. The hardiest and the slowest growing of the full season plants (parsley, cabbage, asters, carnation) may go in first, along with some of the very quick yielders, such as lettuce and radish. Remember to put the tallest growing plants at the back of the frame, where they will have the most head-room. Save your quick-growing, long-season tender plants for a little later sowing; for such things as tomato and nasturtium, if started in the hot-bed

too early, will be so big by transplanting time that they will suffer when moved.

You may, if you think it more convenient, sow the seed in flats, sunk in the soil of the hot-bed. This is not commonly done.

A help in sowing in the soil is what I call a planting-trough,

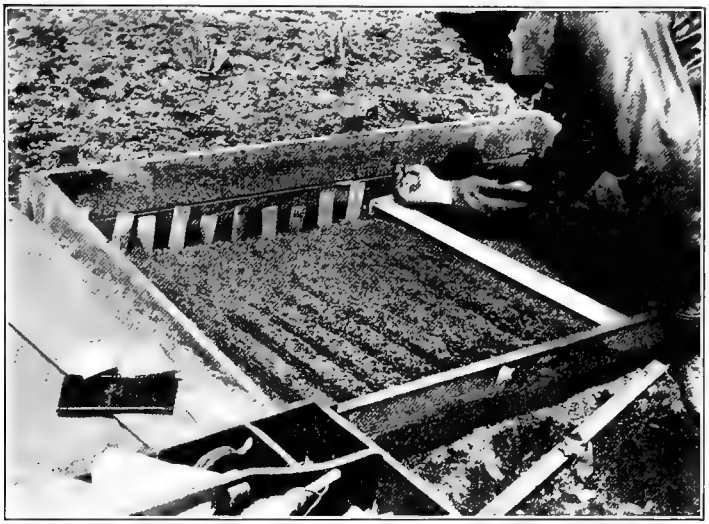

FIG. 82. — The use of the planting-trough. Note the method of dropping the seed into the trough. As soon as a row is planted it should be labeled.

which is a light trough the sides of which slope to an open bottom which is just wide enough to let small seeds slip through. When the seeds are shaken into it from the hand or paper, the sides guide the seed into the right line. Thus the rows are sure to be straight, and no seed is wasted.

Now bank all around the frame with earth, leaves, or hay, put on the sash, and leave the seed to sprout. If the hot-

bed is not too hot (is not over ninety degrees), you may put on mats and shutters as well, and leave them for two or three days. At any rate, put them on at night. But watch the frames daily, and if the soil threatens to dry out, water it. Before very long you will see the cracking of the soil, then the appearance of the lines of fine green. Then the delicate work of caring for the hot-bed will begin.

Part of it is not so delicate after all, since it is but handling the plants much as they were handled when in flats. They must be regularly watered. Watering should be done carefully, with a fine and gentle spray. And as we have learned with our flats and pots, it should be thorough and seldom, rather than slight and often. The plants will root deeper if the best water supply is not near the surface. When they have reached their fourth leaf, or when they begin to crowd, they should be thinned, and soon after that they should be transplanted. Indeed, you may find that the very first thinnings, if carefully pulled, may be set in another part of the hot-bed, and will root and grow. Thinning and transplanting should be done exactly as with the flats, though you will not find the work as convenient as when you had the flats before you on the table. Do not try to transplant unless the seedlings have been freshly watered. Give them plenty of space — and now you will be glad that you have so much room. If you can, pot your tomatoes, peppers, and eggplant, your marigold, calendula, and asters. When you have done so, plunge the pots in the earth; that is, sink them to their rims. They will be slower in drying out, and will not be so much in the way. But the plants should not be allowed to root through into the soil below; therefore, every day or two, lift them in their nests, and turn them part way about. No, this part of the work of taking care of the plants is not so difficult after all.

The delicate part requires judgment chiefly, and not work. You must learn how to keep the air of the frame "just right." With flats we learned that if the earth was too wet, the seedlings would damp off. Here we have the same danger; for in a well-watered, closely shut frame the disease may suddenly strike in. Even if this does not happen, the plants may grow soft and weak in a moist and hot atmosphere. So ventilation must be carefully attended to, so that the air shall be not too moist and not too hot. Yet another danger lies in wait, for the air must not get too cold.

And here the only remedy is to study how to let in just the right quantity of air. But since this depends not only on the temperature of the outer air, but also on the speed and direction of the wind, you must really learn to be weatherwise. You must learn not only how cold the day is when you first go out of doors in the morning, but also how warm it is likely to become by noon. You should know not only how the wind is blowing at night, but also how it is likely to be blowing in the morning.

Are you ready to begin the study now? Do you know, for instance, the points of the compass in reference to your home and the schoolhouse? Do you know which winds in your locality bring rain, and which bring warm weather? Do you know the "feel" of the air when a frost is coming? Can you read the barometer, with any idea as to what its changes mean? If you can do all these, then you are well prepared for this work. If you cannot, then you should master the signs as soon as you can, not only for gardening, but also to be more in touch with the world in which you live. The aspects of nature mean much for our comfort, of course, but are more important for their revelation of the wonders and the beauties of this world.

If you can cultivate the instinct for reading the signs of the

weather, so much the better. At any rate a glimpse of the weather report in the morning's paper will do something. Press into service all the knowledge that you have, ask the opinion of the folk whom you know to be weatherwise, and make it all serve the purpose of bringing your hot-bed through the difficult weeks when a heavy freeze or a snowstorm, or, what is almost as bad, a sudden warm spell, make the problem serious.

Your study must be to keep the air fresh but warm, with not too strong drafts over the plants. A strong wind, even though it may be a warm one, buffets the little plants severely, besides drying out the soil. Air should be admitted, then, in back-drafts, rather than in direct ones, whenever the wind is really noticeable, by lifting the side of the sash away from the wind. You must decide, then, how strong the wind is or is likely to become before you return to the frames, and at the same time how warm the day will prove. If your judgment is good, a very little labor will serve to ventilate the frames.

A thermometer hung in each frame is a great help in this work. Aim to keep the temperature between seventy and eighty degrees by day, and above fifty-five degrees at night.

If you are so fortunate that you can visit the frames whenever you desire, you will find that four times a day will be enough. Go before breakfast, as soon as you are dressed — the sun will probably have been before you for an hour or more, and unless you have the double-glass sash, your plants, if covered for freezing weather, will have lost just so much of his light. Take off the mats and shutters, and open up the frames a little, if the frost is now leaving the air. Go again at ten o'clock, and open still wider. The wind will be blowing stronger now; therefore arrange the sash to protect

the plants from it. Go again soon after three, and close the sash somewhat. And visit the frames at sunset, closing the frames for the night, putting on the mats and shutters if necessary.

If you cannot make these four visits at just these intervals, make your second visit just before school, and your third just as soon as you return. And if you are so busy that you can go but twice, go an hour after sunrise and at sunset. When you go but twice, you are taking something of a risk. For when before breakfast you have to decide what the weather is to be, you will sometimes find the question puzzling; and you may be doubtful, when you leave the frames, whether they ought not to be a little wider open, or a little more nearly shut. I have often worried, when the day turned unexpectedly warm or cold, as to how the change was affecting a frameful of plants which I had been carefully tending for weeks. The hot sun might scorch them through the glass, or the cold wind might chill them. In such cases the plants must shift for themselves, until the gardener returns eagerly to the rescue.

It will be something of a help if you have your hardy and tender plants in different frames, or under different sash in the same frame, separated by a partition set under a rafter. You can then treat the two kinds of plants differently, giving the hardy plants more fresh air.

And now, how to give this air? Frames can be opened in different ways, chiefly by sliding the sash up or down, by lifting the sash at the back or front, and by lifting at the side. If lifted, they are kept in position by some sort of prop, best a triangular piece of wood, or a piece made in steps, so that the sash may be left at any height one chooses. If lifted, raise the side away from the wind, so that it does not blow directly on the plants. Open but a little at first; but as the plants

grow bigger and the weather milder, open wider, until by day you can take the sash entirely off.

At night you must make the best guess you can as to the temperature. Beginning in February, you may be sure that you will need both mats and shutters every night for some weeks. But as the nights grow milder you can first leave the shutters off, except on nights when you feel sure that the wind will blow off the mats if they are not held down. Later, however, will come the time when if there is a wind you may be sure that there will be no heavy frost, so that not even mats will be needed, if only the sash are shut. Sash alone will shut out an ordinary light frost, if the plants are not touching the glass. Leaves that touch the glass will be nipped by a late frost, unless the mats are on.

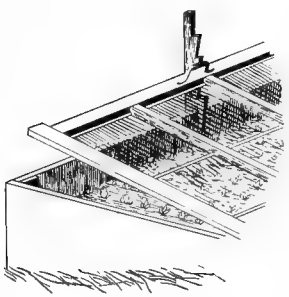

FIG. 83. — One way of ventilating the frames.

As the season passes on, and your plants grow with the spring, they may grow too fast and too soft if the hot-bed still remains hot. This is the time when the greenhouseman allows his fires to burn low. Luckily for us, about this time the heat of the manure dies down, so that by the time frosts cease, and the chill is leaving the open ground, our frames are no longer hot-beds, but of their own accord have become cold-frames.

(And when we take down our frames, by the way, and take up the sub-frame to store for another year, we shall find the manure all ready to use in the garden for plant-food.)

Cold-frames, if we should now start them, are managed much the same as hot-beds, although through a shorter season. They must be ventilated as the other frames are,

and covered at night in the same way. If we use them alone, they will bring on our young plants two or three weeks ahead of the ordinary season. If we use them with hot-beds, we can transplant into them, by way of making our plants hardy; or we can start in them a second crop of the plants that we need the most.

FIG. 84. — Hardening-off cucumbers, melons, and marrows. Strawberry boxes are better than pots.

At any rate, our frames, whatever kind we use, will, if only we use them right, give us strong plants early. We can transplant from them, or we can leave some of the plants to mature there. Radishes and lettuce can grow in the frames until picked. Tomatoes, asters, and carnations can remain after the frames are stored, and will give fruit or flowers before midsummer.

We can even use cold-frames with perennials, such as rhubarb, asparagus, strawberries, violets, peonies, or bulbs. We cannot put the hot manure under them, of course; but by the aid of glass we can get our flowers or vegetables weeks ahead of the season.

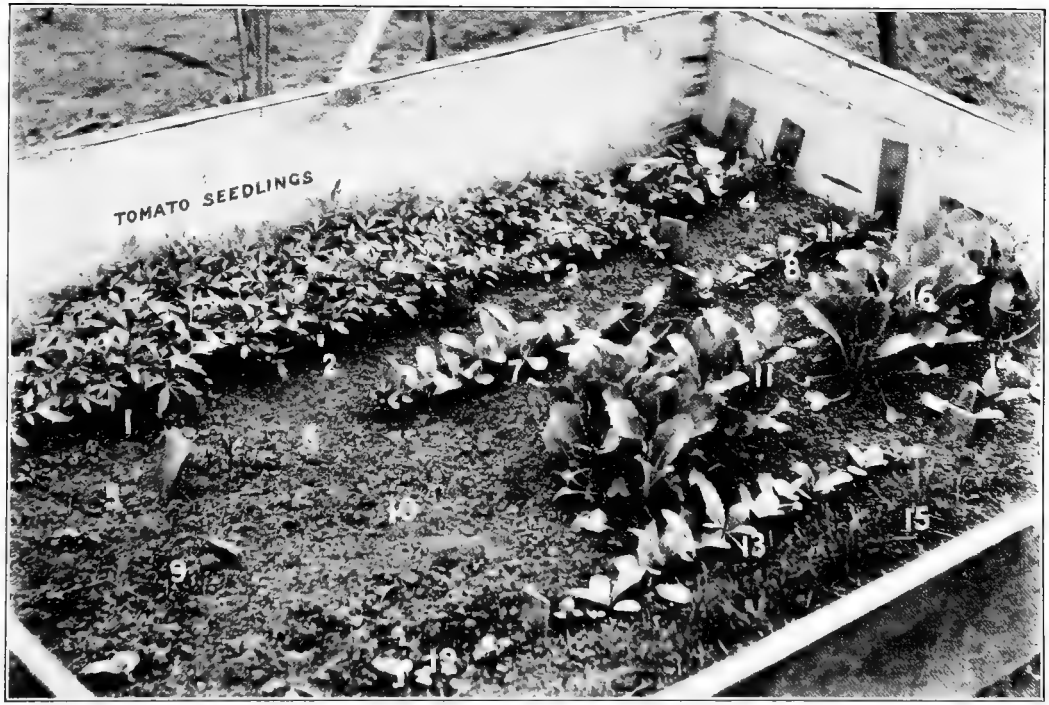

FIG. 85. — A single small home-made frame will provide many seedlings. Besides the thick crop of tomato seedlings, this frame holds: 1. Strawberry tomato. 2, 3, 4. Varieties of eggplant. 5, 6. Pepper. 7. Cardoon. 8. Muskmelon. 9, 10. Udo (both failed). 11. Cauliflower. 12. Rhubarb. 13, 14. Varieties of globe artichoke. 15. Fennel. 16. Cabbage.

Review Questions

1. How much manure do you need for your hot-bed? How can you make sure that the manure is good?
2. Explain how you intend to handle the manure. When will it be safe to plant?
3. How and what will you plant?
4. How will you ventilate? At what hours?
5. Why would it be well to have your hardy and tender plants separated?

CHAPTER XXIII

Other Plant Protectors

The beginner in gardening often feels that cold-frames or hot-beds are too much for him to handle. To begin with, they cost a good deal, especially the hot-bed, with its sub-frame, top-frame, sash, mats, and shutters. And again they are heavy. Even a junior sash might, in a wind, tax the strength of a very young person.

But these are no reasons for giving up frames entirely. They help so much that if we can use them, we should. I propose to explain how we can make a beginning in the use of frames, even if we have but a single one big enough for only a single plant. And at the same time I shall suggest a substitute for glass.

Over in France (where there are, I suppose, the best gardeners in the world, raising wonderful vegetables on small patches of ground, of which they use every corner, even to the flat roofs of the houses), they use individual covers for separate plants. Bell-glasses are found to be the best: big tongueless bells of glass which can be placed over the heads of lettuce, or of young cauliflowers, to protect them at night or on cold days. Nobody uses them here; at least they are not on sale in America. But we can use some kind of substitute.

Nothing is so good as glass, which lets in light on all sides. But glass is expensive, heavy, and brittle. We can instead use boxes, of which the top and bottom have been knocked off. Tiny frames these are, and for sash we can use single

panes of glass, either sliding in grooves, or laid on and held in place by a stone or a little earth. If we can so trim the box, or will so place it, that the top slants (set it slanting toward the south !) then the sun will get at the plant better.

If you wish to use a box as large as a soap-box, then you cannot wisely use single panes of glass. They break too easily, and cost too much. Make then a simple sash, of the proper size, to hold the small panes.

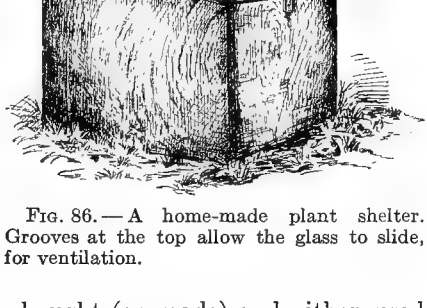

FIG. 86. — A home-made plant shelter. Grooves at the top allow the glass to slide, for ventilation.

Such small frames as these, varying from one to two feet square, can be bought of the makers of cold-frames. Convenient oblong frames, about three feet by one, can also be bought (or made) and either used singly or made to cover a whole row of plants.

In such small frames as these, plants can either be set or sowed. Inside a box a foot square an aster or a lettuce plant can be coaxed along ahead of its brothers until it is big enough to flower, or to be eaten, a couple of weeks ahead of them.

And now to the substitute for glass. To keep out the cold and to let in the sun, we can use common cheesecloth. For our cold-frame, instead of our big sash, three feet by six, holding a good many panes of glass, heavy in consequence, and fairly expensive, we can use a rather flimsy frame of the same size, over which cheesecloth is tightly tacked. To keep the cloth from sagging, there should be at least one brace across the middle of the frame. Any boy or girl who is clever with tools can make such a frame as this, and even if all the

materials have to be bought, the expense is very light. If boxes are used, the cheesecloth is simply tacked across the open top.

Cheesecloth frames, if we make them, can scarcely be used for hot-beds. The cloth is not so good as glass for keeping out the cold or letting in the sun; and in time of

FIG. 87. — This small frame, with cheesecloth tacked over it, is excellent for forcing melons or protecting cabbage from the maggot-fly.

heavy frosts glass is far the best. But after frosts have gone it is surprising how effective cheesecloth is.

Indeed, at this time of year cheesecloth is in some ways better than glass. To begin with, the cloth lets the air through, so that the frames can be left without ventilation at all. Even in a hot spell the cloth tempers the sun so that the plants are not burned. Again, the cloth keeps out insects that may do harm, while on the other hand it lets the rain strike gently in.

Thus in the Connecticut valley is grown some of the best

tobacco in the world, and all because of vast cheesecloth covers, higher than a man's head, stretched over whole fields. The moist air inside the frames is like that of Cuba. And so squashes and melons in the vegetable garden, if kept under little cheesecloth frames, easily made out of a soap-box or a peach-crate, will grow far better than others which have no protection. Cabbage and cauliflower, in regions where the maggot is abundant, will succeed under cheesecloth when they will fail under glass. This is because when the glass is raised the maggot-fly can get at the plants to lay its eggs, while under cheesecloth the plants are safe.

Therefore if you have no glass, try cheesecloth instead. Use both if you can, but do not do without one or the other.

Review Questions

1. How can boxes be used for protecting plants out of doors?
2. What is the best substitute for glass over a frame?
3. Can this substitute be used for a hot-bed?
4. In what way is it sometimes even better than glass?

General Review Questions

1. What do you consider the best method of starting seeds indoors?
2. What plant family suffers if it is transplanted? How do you treat it?
3. Describe the best flats you have seen. How were they drained? Suggest improvements.
4. Why is it well to sow seeds in sand?
5. What is damping off? Did it happen to your plants? Can you tell why?
6. What pots did you use for your seedlings?
7. What success did you have with your hot-bed? Would you handle it differently next year? Would you place it elsewhere?
8. What is the use of cheesecloth in gardening?

SECTION IV

THE REAL GARDEN

CHAPTER XXIV

Starting the Old Garden

If one has an old garden, which other members of the family have worked in previous years, or if one even has a garden which was dug last fall, so that the frost has been mellowing the ground all winter, then the work of beginning the outdoor garden year is not very difficult.

The first thing to do is to watch until the frost is out of the ground. From time to time we test the soil with a fork, or with a crowbar. As the days pass and the sun grows stronger, the tool will go deeper and deeper, until at length the time arrives when the fork can be thrust into the ground to the full depth of its tines. Then the real work of the garden is almost upon us.

It is not wise, however, to dig the garden until by a few experiments we make sure that the ground is dry enough to be worked. Wet or clayey soil will lump or puddle unless we wait until it is sufficiently dry to crumble when lifted with the fork.

But when the time comes, then all the open garden may be dug. First the bare ground is spaded; it will be ready first. Spade next the ground which last fall was in sod. Get out all the living roots of witch-grass or perennial weeds such as sorrel. The frost has killed many of them; be sure you get the rest. Finally spade in the cover-crops, taking care to

cover them deep, so that they will not interfere with the work of planting. If you do not understand how to do this work, study the chapter on Preparing the Soil. And if you can afford to dig in manure, do it everywhere except where the potatoes and the peas and beans are to go.[1]

This work is to be done everywhere in the garden, whether

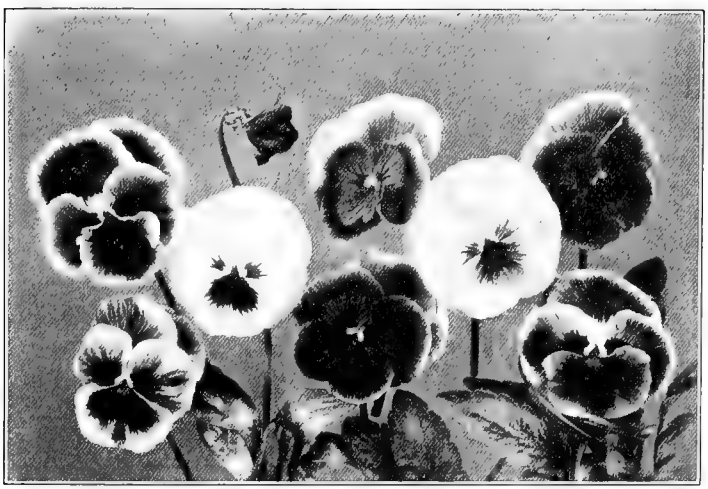

FIG. 88. — It always needs careful study of the season to know when to remove the cover from pansies and other mulched plants in spring.

in the vegetable garden or the flower beds, where there are no plants. It is easiest in the bare ground, where the spade goes in easily. But the work cannot be done at once where there are mulched plants that have lived through the winter. Under their mulch the frost still lingers after it has left the

[1] Find in this book why potatoes should be given no *fresh* manure, and peas and beans (or all legumes) none at all. Write the answer in your notebook.

open ground. It always needs careful study to decide when to remove this mulch. For since late frosts may come and injure the young shoots, if they start too early, the mulch should be used to keep the plants from starting. Yet when the frost has left the ground around these plants, and they really do begin to grow, then they are weakened if they have to struggle through the mulch. Watch, therefore, daily, the mulched spinach or strawberries or peonies or foxgloves, and when they really begin to sprout draw away the mulch from the crowns. It may be left lying near for a while, in order to cover the beds again if a frosty night comes. But when frosts are really gone, the mulch should be entirely removed.

If the mulch was manure, it can be dug into the ground, taking pains not to injure the roots of the plants, nor to loosen them in the ground. Rotted leaves can be treated similarly. But very coarse stuff, such as straw or corn-stalks, should be carried to the compost heap.

The work of beginning the year with an old garden is thus very simple. But if the garden must be made for the first time the difficulty is much greater, since even the place where it is to be is not yet chosen.

Review Questions

1. How can we know when the frost is out of the ground?

2. Can we at once sow seed? What comes before sowing the seed? What must we wait for first of all? Are different soils different in this particular?

3. Why should we not take the mulch off the flower beds early? Why not leave it very late? When do you mean to take yours off? Why can it not come off on the same date each year?

CHAPTER XXV

The Garden Site

If you know of any successful gardens in your town, it will be worth your while to study their position. Do the same with the school garden. Of each one ask yourself the questions: has it sun? is its location attractive? At the same time ask yourself: which of these two factors is the more important? Again, which is more important to the plants, and which more important to you?

With a vegetable garden there can be no question. The greatest beauties of such a garden are neatness, regularity, and a vigorous growth of the plants. Neatness and regularity can be secured anywhere; but plant growth depends so largely upon the sun that the vegetable garden should always, when possible, be entirely free from shade.

With the home flower garden the problem is different. Some flowers — for example, the lily-of-the-valley — do best when they have shade for a part of the day. Others, like the pansy, seem to do as well in partial shade as in full sun. Again, the flower garden looks better when set against some background, such as trees or shrubs, which cast a shade. And, finally, I am a little inclined to think that flower gardeners themselves like a little shade now and then better than do vegetable gardeners. I do not know whether the fact that growing vegetables means working for profit, while growing flowers means working for pleasure, makes this difference; yet in

many cases the difference is plain. The flower garden, then, may appropriately have a little shade.

A windbreak is of value to a garden, to keep it warm and sheltered, and to prevent the winds from continually drying it out. If we have no windbreak, we should grow one. Evergreens (hemlock or spruce) are best for the purpose. Plant them where they will check the strongest winds without cutting off the sun. And if the garden is to last for but a year, we can grow a windbreak out of quick-growing annual plants, such as sunflowers or Jerusalem artichokes.

FIG. 89. — The child, the yardstick, and the Jerusalem artichoke. A summer windbreak, grown in one season.

But there are other matters to consider. In the next place the wise gardener considers the convenience of his garden. It should be as near the house as possible, to save steps. It should be close to the water supply. It is all very well if one can run a pipe to the garden; but usually we have to content ourselves without. So we want to be as near as possible to the faucet or the pump. In choosing

between two sites, then, remember that the nearer one may make it possible to spend a few more minutes there each day, or to carry there the few more gallons that will help the newly transplanted seedlings to grow vigorously.

It may so happen that we have not a true southerly exposure, but must choose between a southeasterly and a southwesterly. The easterly is better for two reasons. The morning sun is better for the plants, since it begins gently, and dries the dew before the plants can burn. But the westerly garden first gets the sun when it is high and hot, yet often while the dew is still on the leaves. We learned in window gardening that the hot sun will scorch wet leaves, and we are sure to find this true in the garden. Our second reason for preferring the easterly exposure is that the east winds are warmer and gentler than the west. Easterly gardens are therefore earlier than westerly ones; yet because the southerly garden gets on the whole more hours of sunshine, it is the best of all.

Another consideration is not to be forgotten. A garden in a hollow gets the earliest and the latest frosts. On the hill top it may get biting winds, but in the valley it will get the killing cold. Unless you cannot help it, therefore, do not put the garden in a hollow.

But we have said nothing of soil, which is extremely important. And here we may be puzzled, for the frosty valley in the hollow will doubtless have the deepest loam, the wash of the hillside for many years. Tested for sourness, however, with a bit of litmus paper, the reddening of the blue slip may show the soil to be more sour than the soil higher up. Or if we dig and with some of the earth in our hands try to see if it is ideal garden soil, dark colored, but light in texture and falling easily apart, we may find it clayey and sticky.

Again, dig deeper still, and below the loam find the sub-

soil. Since we do not want the garden to be soggy, we shall be disappointed if below the loam we find clay or hardpan, which will not let the water drain away, and which will keep the roots from striking deep. We want, if we can get it, a sandy or a gravelly subsoil, which will not let the water stand near the surface, but will drain it away, letting in air at the roots of the plants.

With all these various considerations, we shall find it hard to choose where our garden shall be. One site may seem best for some reasons; another will be better for others. What we must do is to balance the advantages and disadvantages as best we can, and decide on the place which, all in all, seems the best.

One thought may comfort us if it happens that we must put the garden where all the rules say no garden should be. The position may be frosty and shady, the soil may be clayey and sour, the exposure may even be toward the north, which is the worst of all. Let us remember that every spot will grow some plants well, and many plants pretty well. Doing our best with what we have, we should be able to achieve something quite worth while.

But better still, we can ourselves improve the conditions under which we must work. We cannot change the exposure, but perhaps we can cut away the tree, or the bough, that makes too much shade. We cannot change the frosts, but we can be ready to protect the plants against them. And we can make the soil almost entirely over. We can break up the hard subsoil, and drain the extra water away. We can put sand and manure and lime into the cold, heavy, sour soil, and make it warm, quick, and sweet.

There is no reason to be discouraged, therefore, with the site that we must choose. Let us watch it carefully for a week or so, study the shadows and the compass, and find the best corner that we can. Then let us study how to improve it.

Review Questions

1. Where will you place your garden? Why not nearer the house? Why not farther away?
2. Is your garden likely to be frosty? Why?
3. What soil have you? What is its defect? How can you improve it?
4. What exposure have you? Have you a windbreak?
5. Describe the garden site as you would like to have it. Are you discouraged in not having it so?

CHAPTER XXVI

Planning the Garden

Planning the garden is good winter work. At any rate, it ought not to be left till planting time. If only we know how much ground we are willing to cultivate, and have studied where our loam is heaviest and lightest, so that we can suit the plants to the soil, we can save much hasty work later. Having measured our garden exactly, we take our pencil and paper, and draw a plan to scale.

Drawing to scale means that the proportions of the garden on paper are exactly the same as in the field. An inch, or a half inch, or a sixteenth of an inch will represent a foot. The best means for making such a plan is a sheet of paper ruled in small squares, such as you can buy at the stationer's. With this you save much puzzling and measuring, if only you let one side of a square represent a foot or some such definite distance.

Next we need to make a list of the plants that we shall have. They may be flowers, or vegetables, or both; but with the list in hand we must make sure that we understand the needs of each one. Plants classify according to their needs. We have already begun to take advantage of this classification by growing in frames the plants that will not stand frost, or that will transplant easily, or that it will pay to transplant. We need now to study the sizes of plants and the room they need, with the length of time that they

will occupy the ground. As soon as we know this we can tell where we wish to put them, if we understand the following.

Short-season plants should have the "earliest" soil.

Each plant should be given all the room it needs.

Plants should be placed so as not to shade each other.

Short-season plants may be planted close to long-season plants if they are so spaced that the earlier are out of the way before the later need the room. This is called "companion cropping."

Short-season plants may be followed in the same ground by short-season plants or by transplantings of long-season plants. This is called "succession cropping."

As a matter of fact, much of this applies only to vegetables. Flowering plants are often crowded, or "massed," for the sake of the many blossoms. And except bulbs, which stay in the ground until midsummer, there are no flowering plants which, like radishes and lettuce among the vegetables, are dug up early. But with a gardener who knows the habit of plants, even flowers may be made to yield a good show in a small space by a kind of companion and succession cropping, if only he is willing to pull out his plants when they are past their best bloom. Let me now say a few words about the kinds of gardens separately.

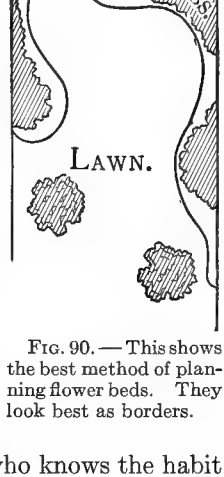

FIG. 90. — This shows the best method of planning flower beds. They look best as borders.

Flower gardens are commonly in two forms, beds and borders. A bed is a space of open ground; it is likely to be much like a vegetable garden — that is, stiff and precise.

Better, to my mind, is a border, which is explained by its name, being an edging of flowers along a wall, a shrubbery, or the house. Indeed, I advise making a flower bed into a border by putting shrubs to the north of it, or behind it. If the flower garden must stand by itself, surround it with shrubbery, walling it off from the rest of the place. Then make the garden a border with a wavy edge all around the inside. The center will be grass, or will have grass paths, and the whole garden becomes sheltered and homelike.

The planting of such a garden must be determined largely by its shape and the amount of shade. Shade-loving and sun-loving plants will have their places naturally marked out for them; but besides this, the lower plants should naturally stand at the edges, the taller ones farther back. Thus a free-standing bed will have the plants rising gradually from the edges, till the middle of the bed will hold the tallest. A border will have its flowers graded upward from the edges to meet the line of the shrubs.

It is a good deal of a question whether to set flowers in lines or in groups. Lines are simplest to plan, and easiest to care for. Yet a set of lines, all exactly alike, and running parallel, looks very stiff. Their color at least ought to be broken. While it is quite proper to have the edge marked with a line of one kind of low plants, inside this the plants may probably best be arranged with plants in groups, according to sizes and colors. Do not forget that both size and color are important in plant-neighbors, and train your eye, by constant study of the gardens that you see, to find pleasing combinations or contrasts. This is not natural to boys; yet there are few more pleasant or satisfactory accomplishments, not merely in gardening but in the whole arrangement of things about us, than the ability to plan modest and fine color groups.

In the planting list will be found more than I can here say about the different flowers, but I wish to speak briefly about those which are easiest and best to grow in a beginner's flower garden.

For borders or edgings, the best annuals are sweet alyssum, candytuft, Drummond phlox, and the dwarf nasturtiums. All of these can be kept blooming, once they have begun, by cutting off every faded flower. Sow them where they are to stand.

To grow in clumps

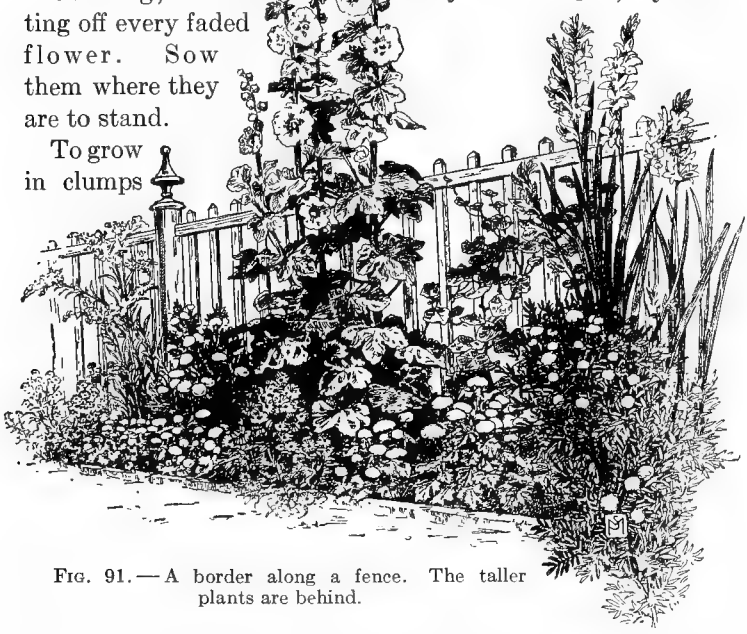

FIG. 91. — A border along a fence. The taller plants are behind.

are the following, given in order according to their heights. They all transplant easily, except the poppy. Six inches: pansies; will make a solid bed of color. One foot: calendula, pink, mignonette, dimorpotheca. Eighteen inches: petunia, snapdragon, stock, zinnia. Two feet: calliopsis

(or coreopsis), marigold, salvia. Three feet or more: balsam, centaurea (corn-flower or bachelor's button), cosmos, sweet peas, climbing nasturtium. Of varying heights, according to their varieties, are cosmos (three to five feet),

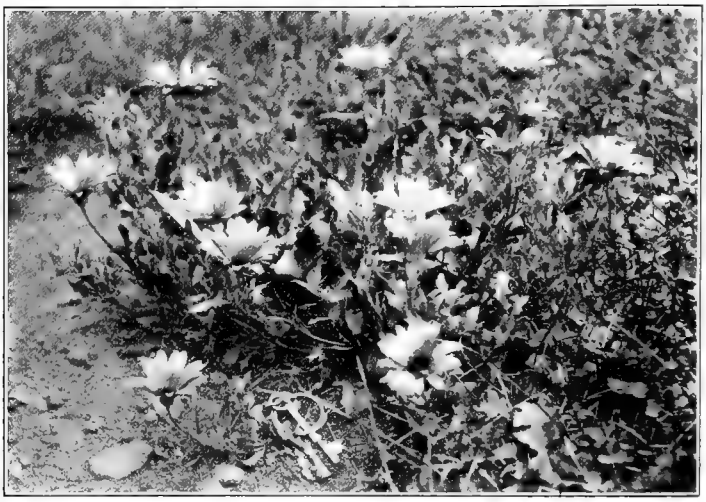

FIG. 92. — A fine new low-growing plant. Dimorpotheca, or South African daisy.

poppies of many kinds (one to three feet), sunflowers (three to six feet), centaurea (one foot to forty-two inches), asters (nine inches to two feet).

Of these plants the hardy ones are alyssum, calendula, candytuft, centaurea, marigold, mignonette, pansy, phlox, pink, poppy, stock, sweet peas, zinnia. The half-hardy are aster, dimorpotheca, salvia, snapdragon. The tender ones are balsam, calliopsis, cosmos, nasturtium, petunia, sunflower.

This same group of plants will bloom in the following months:

June

centaurea			petunia	sweet pea
pansy (started the previous summer)			poppy	

July

balsam	cosmos	nasturtium	poppy	sweet pea
calendula	dimorpotheca	pansy	salvia	zinnia
calliopsis	marigold	petunia	snapdragon	
centaurea	mignonette	pink	stock	

August

aster	cockscomb	mignonette	pink	stock
balsam	cosmos	nasturtium	poppy	sunflower
calendula	dimorpotheca	pansy	salvia	sweet pea
calliopsis	marigold	petunia	snapdragon	zinnia
centaurea				

September

aster	cosmos	pansy (started in April)	stock
calendula	dimorpotheca	petunia	sunflower
calliopsis	marigold	pink	sweet pea
centaurea	mignonette	poppy	zinnia
cockscomb	nasturtium	salvia	

The colors of these vary widely; some of them, such as asters and sweet peas, are to be had in almost all colors. Ordinarily they are as follows:

asters, all colors
alyssum, best in white
balsam, pinks, reds, white
calendula, yellows
calliopsis, yellow with red or brown
candytuft, best in white
centaurea, best in blue
cockscomb, brilliant reds
cosmos, pink, white, crimson
dimorpotheca, orange
marigold, yellows
mignonette, flowers in spikes, with blossoms of pale yellows and reds (get the best seed)
nasturtiums, yellows and reds

pansy, most colors, very varied.
petunia, crimson, pink, white (seed expensive, but buy the best)
Drummond phlox, white, red, yellow
poppy, yellow, pink, red, white
salvia, scarlet
snapdragon, white, yellow, the reds
stock, white, yellow, pink, red
sunflowers, yellow
sweet peas, all colors
zinnia, strong yellows and reds

This list is chosen from among a bewildering number. You will have neighbors who can tell you of favorites which are not here, and which probably are more difficult to grow. Yet for a small garden even this list is too large. For such a case the following are suggested, as being both easy to grow and worth growing. For the edging, sweet alyssum. For the bed, summer cosmos, marigold, mignonette, nasturtium, Shirley poppy, sweet pea, zinnia. The sweet pea gives very beautiful flowers for picking, but the plant is not beautiful. It must be grown on a trellis of some kind. Dwarf sweet peas do not always do well. More lovely than any in this list is the aster, but it needs care. The list, with or without the aster, will give plenty of flowers after the end of June, if only the faded blossoms are daily picked.

The making of a flower-garden plan is, even at the simplest, a rather difficult thing. Success depends not only upon knowledge, but also upon taste, which few of us stop to study. Therefore in planning, carefully consider colors and heights. If you intend to buy your seeds of a seedsman, study his catalogue to know what varieties you intend to buy, and use these in planning. The plan, as made upon the squared paper, will show the edgings and groups in irregular outlines. In the centers of these mark lines or dots, to show where the seed is to go. If this is done with care, the real garden will be like the plan.

A vegetable garden is an entirely different thing. It is

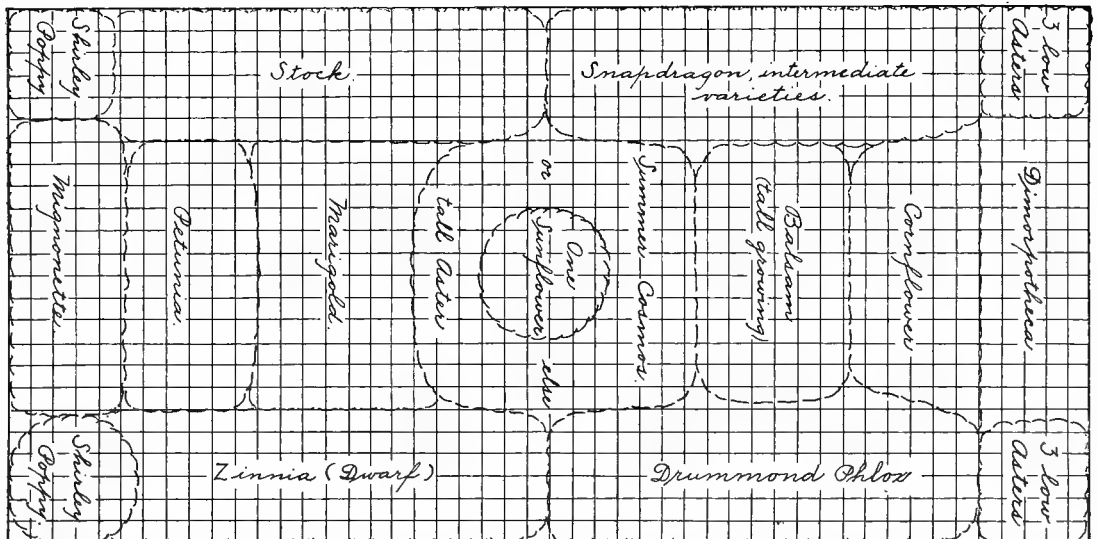

FIG. 93. — A suggestion for a flower grouping. Consult your seedsman in order to get varieties which harmonize. Sow the poppies in a central six-inch ring. Space the aster groups carefully. Of the rest, sow the seed or set the plants along the middle of each space. The garden is twelve feet by six, the squares three inches.

stiff and square cornered, made for business only; that is, it is planned to do the work with the least possible effort,

FIG. 94. — Asters are very lovely plants, but require a little more care than common.

with the rows in straight parallel lines. It should always be in full sun wherever possible, and the rows should run north and south, so that the sun in the morning can reach one side,

and in the afternoon the other side, of the plants. The distances of the rows from each other are determined by

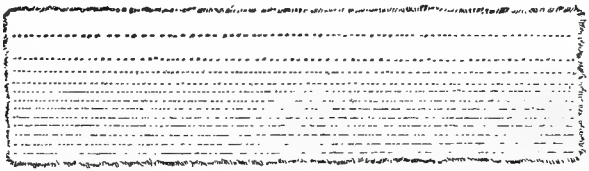

FIG. 95. — The stiff plan of a vegetable garden, with plants in rows according to height.

the height of the plants or the space they occupy, so that they shall neither shade nor interfere with each other.

In planning such a garden, taste is not so important as knowledge. For the flowers of vegetables are short-lived or not noticeable, so that a good healthy green is the best color that we can work for. Therefore what we need to know about vegetables is their size and their season. Then we can plan properly.

FIG. 96. — Kohl-rabi is a useful vegetable which can be quickly grown in a small space.

Short-season vegetables are those which are picked so early that others can be planted in the same ground and picked before winter. They are chiefly radishes, cress, lettuce, spinach, beets, peas, onions (grown from sets), dwarf string beans, kohl-rabi, tur-

nips, endive, Brussels sprouts, and the early varieties of corn, carrots, cabbage, and cauliflower. I have put these pretty nearly in the order in which they will be picked. If some of them (lettuce, cabbage, cauliflower, onion) are started in frames, and transplanted to the garden, they will finish earlier than if planted in the open ground. Corn and beans are usually spring-sown, Brussels sprouts and endive usually summer-sown. The others may be planted in either spring or fall. Because frosts may come early in the fall is the reason why corn and beans, which are tender plants, are seldom sown in summer. The rest are all hardy plants.

FIG. 97. — Beets yield two vegetables, the greens and the roots. Cook the smallest beets with the greens.

It is worth noticing that, except peas and corn, all these plants are small. Every one of them can be planted in rows eighteen inches apart or less, but the tall peas and dwarf corn should be twice as far apart. From these plants we go to the longer season plants, some of which are likewise small. Onions, grown from seed, late carrots, parsley, and salsify may also stand eighteen inches apart or less. But all the other late vegetables had better be either two feet apart (late cabbage and cauliflower, egg-plant, okra, pepper, parsnip, potato), three feet (pole beans, celery, corn, bush squash, cucumber, tomato), or four feet or more (squash, marrows, melons). There are, of course, variations from this. Celery, started very early, may stand in

rows eighteen inches apart for blanching with boards, while very late celery should stand four feet apart for wintering in the ground. For corn and the squashes the distance will vary with the variety.

All these plants are hardy except beans, corn, cucumber, eggplant, okra, pepper, tomato, and the squashes.

For potatoes, see Chapter XXVII, also the planting list.

If once you have learned all this, you are ready to plan the vegetable garden. What with succession and companion cropping, you may vary the plan greatly. In succession cropping you plant the early vegetables in separate rows, and follow them with others as soon as the ground is clear. The plants that follow may be either other short-season crops, or else transplantings of full-season crops. Thus early crops of radish, lettuce, spinach, beets, peas, or dwarf string beans, may be followed by kohl-rabi, turnips, endive, tomato, cabbage, cauliflower, or Brussels sprouts.

In companion cropping you may plant in the same row long-season and short-season plants, the latter to be out of the way by the time the former need all the space. Thus lettuce, onion sets, or hot-bed onions, may go between the late cabbage or cauliflower or the staked tomatoes. Again, rows of short-season crops may go between rows of long-season crops. Thus radish or beets, or onion sets, or spinach, or lettuce, may be planted midway between rows of late cabbage or cauliflower, and will be picked before the larger and later plants need the room. Or these two methods of companion cropping may be combined in some such way as follows: Plant a row of late cabbages two feet apart, and between them set lettuce. A foot away sow a row of radishes, beets, or spinach. Then, another foot away, set another row of cabbages and lettuce, or perhaps of cauli-

FIG. 98. — This boy's garden is crowded; therefore the soil should be rich, and the culture very careful. Succession plantings should be prompt. Onions, cabbage, and cauliflower should come from the frames. The size of this garden is six feet by twelve. Squares are three inches.

flower and onion sets. The early plants will be picked in time for the later ones to have the ground to themselves.

The only common combination of two long-season plants is the planting of pumpkins between the hills of corn. But since both these plants send their roots widely, they are likely to interfere with each other.

You will notice that I speak of hills. These are the spaces at which large plants, such as squashes, corn, and pole beans, are to stand. We usually calculate them as at the corners of squares, so that these plants are said to stand three feet or more apart "each way." Hills, however, are always in rows, unless we are able to tuck them in odd corners of an irregular garden.

As you plan the garden, mark lightly on the paper the rows and the names of the plants. If you have square ruled paper, the squares will show the exact distances. Study carefully whether neighbors are not too near or far apart, whether you have too much or little of any one thing, whether plants will follow or live with each other successfully. Give to this all the time you can, consult your elders about it, and make all the changes you desire. Your forethought should be well repaid, for a garden should not be a happy-go-lucky thing. Real success in any garden cannot come by accident, and both knowledge and taste are needed in planning. And mere thinking the matter over, without making a plan on paper, is a mistake. To plan a garden as you plant it is merely to invite regret for wasted space and effort.

If your garden is being planned for the second year, be sure to shift the positions of the plants. This is because plants, as a general thing, should not be grown twice on the same ground, either because disease is likely to result; or because they have used up the chemicals which they need; or

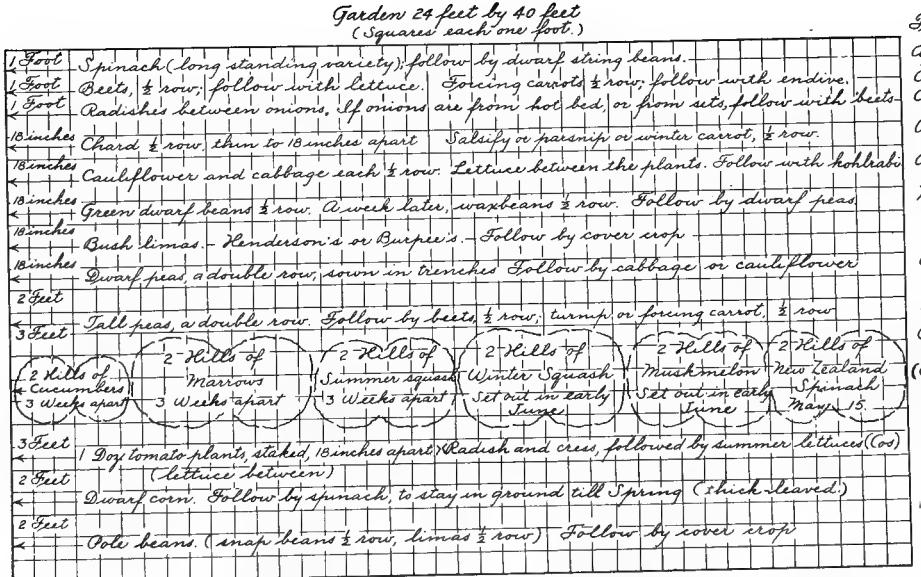

FIG. 99. — This vegetable garden is spaced for careful hand culture. It would be better if the rows of dwarf corn and pole beans had each a foot more room. For quickest results the cabbage, cauliflower, cucumbers, marrows, squashes, and melons should all be started under glass.

in the case of peas and beans, because the ground will now be too rich for them. Plan accordingly, and where last year's peas and beans have put nitrogen in the soil, try to put this year's leaf plants, such as lettuce, cabbage, and spinach.

When the plan is finished, mark it clearly with hard pencil, not with ink or soft pencil, for then it will blot or rub if it gets wet when taken to the garden. Then study how much seed you need. So many feet of corn, or beets, or alyssum: this is easy to calculate. Next turn to the table of seed quantities, in the back of this book, and find how many packets or ounces or pints you will need. For most flower gardens, and for a very small vegetable garden, packets are usually enough; but for a large vegetable garden you will need greater amounts of certain seeds, such as beets, peas, and beans.

The next question is where to buy the seed, which is more important than one is likely to think. For if the seed is not good, and either does poorly or fails entirely, you do not lose it alone: all the work and expense of preparing, planting, and cultivating has gone for little. Therefore make sure to get only the best seed. If you belong to a school or town gardening association, then use its seed. But you may have to shift for yourself. Grocery store seed, such as is displayed in little cases in gayly colored packages, is too often old, or adulterated, or not properly named. Go therefore to a seedsman whose business depends upon the reputation of his seeds; there are such men in the nearest large city. If you do not know the name of one, ask a florist, or write the editor of a farm or garden paper. Get the seedsman's catalogue, and order by mail. Seeds will come long distances safely, and if sent by mail the seedsman will usually pay postage except on heavy packages of peas, beans, and corn. On these you ought to be willing to pay the cost yourself,

in order to make sure that your summer crop is good. Remember of whom you buy, keep a record of the varieties, and in the fall mark on the list whether they succeeded or failed. Thus you can learn which kinds are best suited for your soil; and if you buy of more than one man, you can find out which will serve you best.

Review Questions

1. Why not plan the garden at the time of planting?
2. What kind of paper is the most convenient for making a plan?
3. What is companion cropping? Succession cropping?
4. Where do you intend to put your flower garden? Explain its shape, its size, its background. What will you plant in it, and why?
5. What is the size and shape of your vegetable garden? How will you run the rows? What will you plant in it?
6. What hills will you plant, and at what distances?
7. Where will you get your seed? What do you know of your seedsman?

CHAPTER XXVII

Perennial Plants

In the last chapter, when discussing the planning of the garden, I spoke as if it were to be planted and dug up all in one year; that is, as if all the plants were annuals. That is best with school gardens, with very small gardens, and for all gardeners who are afraid that they may tire of the work. But those who studied the chapter well must have noticed something: that it takes a long time to get flowers or vegetables from seed. The earliest flowers scarcely come before June, and you can get lettuce, which is the first real vegetable (for radishes and cress scarcely count), not very much earlier. Even if you start these in the frames, the waiting is long and slow. Yet as you looked into your neighbors' gardens you saw beautiful flowers in May, or in April saw the gardener carrying into the house large quantities of the best vegetables in the world, and that from the open garden.

Yes, but those were perennials. Your neighbor's columbine, lily of the valley, peony, and among vegetables his asparagus and rhubarb, all were planted in the same places one, or two, or even more years ago. I have before me a list of thirty-two common plants, all flowering in May, but all of them hardy perennials. Gardening seems very easy, does it not, when all one has to do is to uncover the plants when the frost is out of the ground, to rake or dig lightly, and fertilize a little, and then in return to receive handfuls or armfuls of very early blossoms, or be able to cut asparagus

enough for the family meal? And then in fall, when all the other flowers are gone, how satisfactory it is to see the gorgeous chrysanthemums just coming into bloom! The

FIG. 100. — Peonies are easy of culture. Buy the roots.

garden season is lengthened at both ends. But this is the result of the forethought and labor of previous years.

If you are able to secure, at home or at the school, a good-sized plot which shall be yours for two years or more, then perennials are possible. Let us consider what they are, and

how to secure them. Their length of life varies from two years (properly called biennials, in which class there are a few very valuable kinds) to ten years or more. The asparagus is very long lived. Some of the perennials can be quickly and cheaply raised from seed: such are asparagus, foxglove, Canterbury bells, columbine, larkspur, forget-me-not, sweet William, hollyhocks, phlox. All of them can be bought and transplanted, and certain of them must be: such are iris, lily of the valley, peony, rhubarb, yucca, violet. Only the professional plant-breeders grow these from seed. But many perennials grow so fast that every few years they must be divided, lest they crowd each other; others seed themselves, and the seedlings are very numerous. In spring, therefore, it might easily be possible for you to get from your gardening elders roots or seedlings of such plants as rhubarb, Canterbury bell, foxglove, larkspur, Japanese anemone, sweet William, hollyhock, phlox, chrysanthemum, iris, or violet. A real gardener, you will find, loves to give plants away.

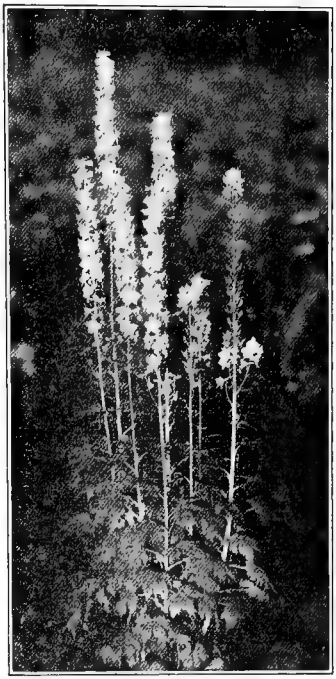

FIG. 101. — Larkspur, one of the finest perennials. These shoots are from a single plant.

These perennials, with some few others which I will presently name, are excellent for young people's gardens, being both handsome and easy to cultivate. In planning the garden for them, one must consider whether or not they are to be grown from seed. Let me first give directions for this, speaking not of vegetables but of flowers.

Perennials raised from seed are, for the first year at least, not handsome, and may very well be grown in an out-of-the-way place, while true flowers occupy the garden. The seed may be bought, or else begged of a neighbor who has particularly lovely varieties. Some seed, such as foxglove, sweet William, and larkspur, should be sowed very soon after it is ripe, preferably in a shady place. Other seed can be sowed in earliest spring, after the seed has been soaked for a day. After the seed has soaked, spread it on a board or cloth, and allow it to dry for an hour, or it will stick together. Do not sow too thickly, thin the plants as soon as they crowd, and when they are strong, say in early June, transplant so that they stand about a foot apart each way, in rows. Treat them now exactly like vegetables, cultivating them after every rain, and in the fall set them with much

FIG. 102. — Foxglove is a biennial. Sow the seed as soon as ripe, if you can get them.

care in the places which you have prepared for them in the flower garden. Then next year they should begin their bloom.

All bought plants, or those given you, are usually ready to set in the garden at once. Divided roots should be set as deep as they stood before. You can tell this depth by studying the remains of the stalk.

Seedling plants should be set with their crown at the ground level, in the seed bed or in the garden, according to their size.

The treatment of perennial vegetables you can study in the planting list.

And now for planning the garden. There are so few perennial vegetables that to plan for them is not difficult. The good ones are asparagus, sea-kale, rhubarb, and udo. The gardener should find what space each requires, settle how many plants he needs of each, and then put them in one part of the garden by themselves. This perennial bed should be to the east or west of the annual vegetable garden, so that it need never be in the way of plowing. The rows should run parallel to the others, and they may be cultivated with them.

And now for my larger list of perennial flowers. The best of them are the following, given according to the months in which they begin to bloom. For April: perennial daisy (*Bellis perennis*, English daisy), lily of the valley, forget-me-not. For May: columbine, German iris, peony, bleeding-heart. For June: Canterbury bell, Scotch pink, gaillardia, Japan iris, Iceland and Oriental poppies, phlox, sweet William, yucca (Adam's needle). For July: hollyhock, foxglove, larkspur, helianthus (perennial sunflower). For August: cardinal flower, golden glow. For September: Japanese anemone, red-hot poker, hardy aster, helenium. For October: hardy chrysanthemum.

FIG. 103. — This crown of sprouting asparagus shows the new shoots and the old stalks. These perennial roots should yield for more than twenty years, the thick storage roots allowing weeks of cutting every spring.

The colors of these also vary widely, the varieties having different colors. The following list may help. Columbine, all colors. Chrysanthemum, best in yellow, red, pink, white. Forget-me-not, blue. German iris, a great variety of colors in combination. Japan iris, best in white, blue, purple, and their combinations. Peony, red, pink, white. Lily of the valley, white. Bleeding-heart, pink and white. Canterbury bell, white, blue. Gaillardia, yellow, red center. Oriental poppy, best in scarlet. Iceland poppy, yellow, scarlet, white. Phlox, best in pink, red, white. Sweet William, white, pink, red. Yucca, cream white. Hollyhock, best in white, crimson, purple. Foxglove, white, lavender, spotted, yellow. Larkspur, shades of blue, but avoid purple. Helianthus, yellow. Japanese anemone, white. Aster, purple. Helenium, yellow. Chrysanthemum, yellow, red, pink, white.

FIG. 104. — Japanese Iris, one of the most beautiful of flowers. The roots like moist soil.

The sizes of these perennials vary greatly, and also their habits. They should be studied in the planting list, and the

knowledge applied to planning the garden. For a short list of the most easily grown perennials, the beginner might try the following: Lily of the valley; forget-me-not; columbine; iris (chiefly German and Japanese); peony; Canterbury bell; phlox; sweet William; hollyhock; larkspur; golden glow; Japanese anemone; chrysanthemum. Of these, forget-me-not, columbine, Canterbury bell, phlox, sweet William, hollyhock, and larkspur can be cheaply and easily grown from seed. The rest should be bought.

The planting of a perennial garden should mean that the gardener is patient and persistent, and that he loves his work. But his reward is worth working for. The list just given includes flowers of the greatest differences in form and color and season, giving a variety which with little labor year after year will delight the gardener and his guests.

Review Questions

1. What are the advantages and disadvantages of perennials?
2. How is it best to treat in its first year a perennial grown from seed?
3. Where will you get your roots?
4. What perennial flowers will you grow? What perennial vegetables?

CHAPTER XXVIII

Bulbs and Tubers

If we use perennials to lengthen the yield of the garden, we may find ourselves wishing to make the season longer still. Bulbs will give us the earliest flowers of all. Moreover, during the summer they give us some very lovely flowers.

Bulbs are marvelous plants, each containing in itself leaf and flower, ready to unfold. The best of them are grown by the patient people of Holland, whose nature and soil and climate fit them for the task. Bulbs are imported into this country in enormous quantities and in all qualities; they are much more expensive than seeds, but since many garden associations offer them to their members, gardeners should understand about them.

Bulbs divide into two classes: those planted in the fall, and those planted in spring or early summer. As already explained, the fall-planted bulbs make roots before winter, then lie snug through the frosts, and in spring push to the light. The spring-planted ones make their roots and then grow at once. Some few bulbs are tender; the one that we are most likely to plant is the gladiolus. This, and some few of the hardy bulbs, should be taken up after the foliage has died. The rest remain in the ground, where for many years new bulbs are made as the old ones die. Such bulbs pay for themselves over and over again.

Compared with other plants, bulbs take up very little

space. Even the largest of them, the lilies, cover when in full growth scarcely more than a square foot of ground. Of the small bulbs, such as the crocus, several can be set in this space. Therefore bulbs can be set among other plants and will scarcely be in the way. Fall-planted bulbs will have finished their blooming, and begun to die down, by the time other plants are getting ready to flower.

FIG. 105. — Lily bulbs are planted in spring. They are hardy.

Bulbs can be planted singly, or in groups, or in masses. They do well in lines in the border, in clumps among other plants or under the shrubs (the very earliest bulbs only), or irregularly but thickly spaced in the grass. Let me speak of those which are to be planted in spring or summer. For all of them the ground should be prepared at least a foot deep; for the golden-banded lily, eighteen inches.

The gladiolus provides large spikes of beautiful blossoms which open one after another. They are to be had in all colors, in the most delicate hues, and flower in August and September. Cover four or five inches; distances, six inches or more. Gladiolus is tender, and the bulbs should be lifted and stored as soon as the tops are killed by frost. The little bulbs which form near the big ones will, if nursed for a couple of years, yield good flowers. Plant early in May.

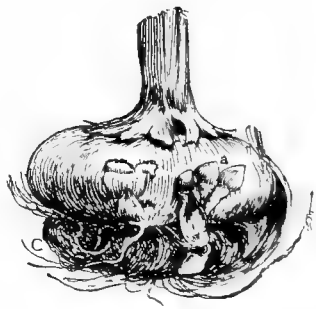

FIG. 106. — Big and little gladiolus bulbs, properly called corms. They are tender.

The lilies all flower in summer. They are all hardy, and need not be lifted in fall. Put no manure near them. Of the many kinds, differing in color, sizes, and seasons, the following are the best:

Lilium auratum, the golden-banded lily, is finest of all (and most expensive!) Set them a foot apart, and ten or twelve inches deep. They flower in July. See Fig. 56.

Lilium speciosum, almost as fine, and hardier. Flowers in July. Cover five inches; set a foot apart.

Lilium canadense, the Canada or meadow lily, likes more moisture than most bulbs. The yellow and red flowers bloom in May. Cover four inches; set nine inches apart.

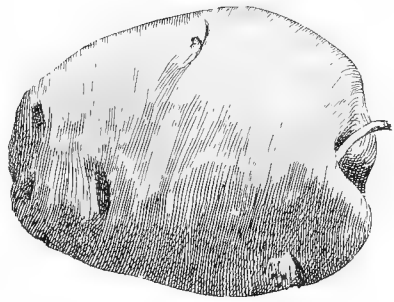

Fig. 107. — The potato, our commonest tuber.

Lilium tigrinum, the tiger lily, blooms in early July. It can be raised from the little black bulbs which grow on the stalk. Cover the large bulbs four inches; set nine inches apart.

The Annunciation lily, *lilium candidum,* should be planted in August or September for next summer's bloom. Cover four inches or more; set nine inches apart.

All lily bulbs, when out of the ground, should be kept in wet sand or moss, and not allowed to dry out.

Besides bulbs, tubers can be planted in spring. These give us the potato, our most important vegetable, and the Jerusalem artichoke, with the canna and dahlia among flowers. All of them take more space than the bulbs. Just a word about each of them, remembering that all should be set four inches deep, and that all must be lifted in the fall.

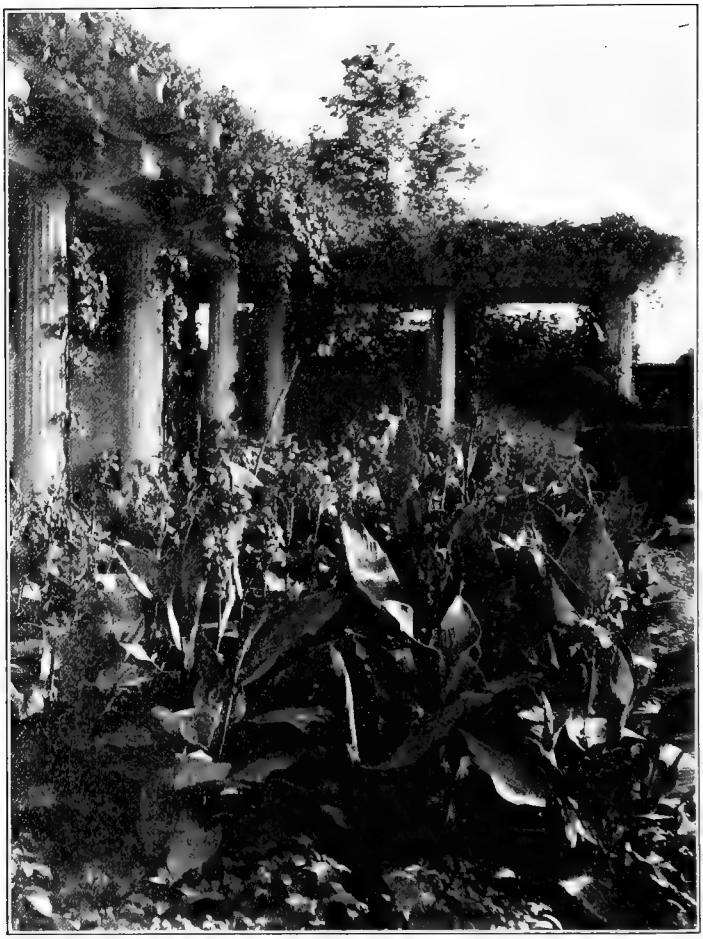

FIG. 108. — Cannas make a fine show of leaves and flowers.

The potato, set under ground, produces, also under ground, several others of the same kind. A small potato (about the size of a hen's egg) may be planted, or a larger one may be cut into pieces for planting, each having one or more eyes. *See the planting list.*

The Jerusalem artichoke will not be popular among us till we import the fine European varieties. It is a nourishing vegetable, and yields yellow flowers. Though the tubers are hardy, they should be dug in the fall, lest they spread and become a pest. *See the planting list.*

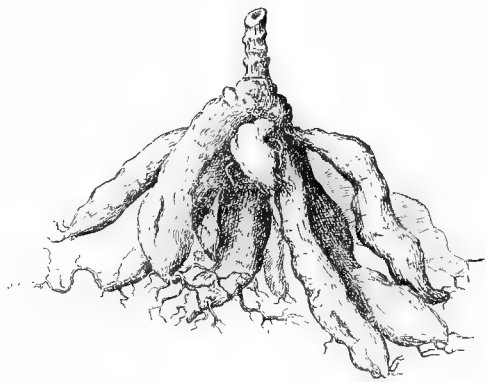

FIG. 109. — A clump of dahlia tubers, produced in a year from a single one.

The canna makes large bronzed leaves, with a spike of red or yellow blossoms. It can be raised from seed or tubers. Give two feet of space. Extra large tubers may be cut, as are potatoes. For early results, seeds or tubers may be started in frames.

The dahlia, like the canna, has been very much improved of late, and gives some of the handsomest August and September flowers, in many forms, sizes, and colors. They may be raised from seed, but tubers are best and surest. Set two feet apart. Single tubers have but an eye or two, and should generally not be cut; in the fall they will be found to have produced a clump of tubers, which in the spring can be divided and set separately.

These two classes of plants, the bulbs and tubers, are much more difficult to handle, and are, besides, much more expensive, than seeds. Small gardens can easily do without them, and beginners may very well let them alone for the first year. But after that the true gardener will find his interest in them beginning, and he will not be satisfied till he has some of his own.

Review Questions

1. What is a bulb? What bulbs should be planted in the spring?
2. Name certain great advantages of bulbs. Are you going to plant any?
3. What is a tuber? What space do they require compared with bulbs? Are any of them valuable to use? Shall you plant any? Which ones, and why?

CHAPTER XXIX

Shrubs

As one of the best means of setting off a garden is the proper use of shrubs, I shall write briefly about them. They are the finest background to any garden, and are often in themselves very beautiful.

In choosing shrubs it is wise to consider those which grow wild in the neighborhood, for they are sure to stand the climate. They may be bought of nurserymen, or may simply be dug in the woods in early spring or fall, but should be taken while young. A large wild shrub transplants very poorly. Those bought of nurserymen transplant better, but still ought to be as young as possible.

At the same time many of the shrubs which have been brought from other regions do very well in our country, and have special beauties of their own. They must be bought of nurserymen, grown from seeds (which is very seldom done, because it is extremely slow), or from cuttings.

The choice of shrubs depends partly upon the season of their bloom. It is wise to try to have some of our shrubs blooming at each season. The choice depends also upon the attractions of the different shrubs, whether the flowers, or the foliage, or the berries or pods. I will write of them under these headings, choosing only the best all-round kinds.

Spring flowering shrubs are the following. Very early are the daphnes, forsythias, and pussy willows. Later come the ornamental varieties of the fruits (apples, peaches,

cherries, quinces, and almonds), the mountain laurel, rhododendron, the azaleas, dogwoods, deutzias, lilacs, spiræas, honeysuckles, the mock-orange, the wild thorns, the snowballs. Summer bloomers are rarer; the best are the wild roses, and rosa rugosa, the Japanese rose (these are mostly single. I shall speak of the other roses elsewhere); Japanese kerria, hydrangea, Canadian elder, tamarisk.

Foliage shrubs are the weigelas, oleaster, box, oak-leaved hydrangea, laurel and rhododendron, the privets, the buckthorns, the sumacs, Japanese wineberry, the willows, and some of the viburnums.

Pod or berry-bearing shrubs are the Japanese barberry, the common barberry, the wayfaring tree, rosa rugosa, the hawthorns, the bladder senna, cotoneaster, Japan quince, the elders, winterberry, nine-bark.

Some of these shrubs belong in more than one class. Their number is very great, and the spiræas, lilacs, willows, viburnums, dogwoods, and others have so many forms that a buyer should make the nurseryman carefully explain the differences, pointing them out in the nursery as they stand. Indeed, it is always best to go to a nursery the year before buying if possible, or in the fall or early spring, and see the shrubs for one's self. Or one can roam amongst the neighbors' gardens, learning the virtues of the different shrubs, and so making a choice.

All these shrubs are hardy. A good selection of them is: forsythia viridissima, deutzia lemoinei, several lilacs, spiræa van Houttei, rosa rugosa, hydrangea paniculata.

The soil for a shrubbery should be made as deep and rich as possible. Take out all the stones, wheel in all the compost and manure that you can possibly afford, and spade them in deeply, at the same time taking out all roots of perennial weeds. If you have nothing to put in but fresh manure

or coarse vegetable matter that will not sprout, or even fresh sod, these can be made to serve by taking out all the loam, and burying the material at least eighteen inches deep. There it will rot, and when the roots of the shrubs reach it, the plant food will be ready for them.

The design of a shrubbery should never be stiff. The intention should in general be to produce clumps or borders of shrubs, and not to have single specimens stand about lonesomely. Only very beautiful single shrubs or trees can properly stand by themselves, and of these the shrubs should never be far from a clump of others. Generally, therefore, count on having the branches of the shrubs touch or intermingle. Standing thus, they should not be in lines, the lowest outside and the highest inside, as with a flower bed. They should rather be in groups of three or four or five of the same kind, so that the height of the shrubbery will rise and fall irregularly. The outline should be curving or wavy, not straight. This looks like nature's planting, and is the most pleasing. One habit of shrubs we can depend on to make such an arrangement satisfactory. As soon as they are growing well, their outer branches will droop and almost sweep the ground. Thus they will appear to rise from the grass, or from the flowers that stand in front of them.

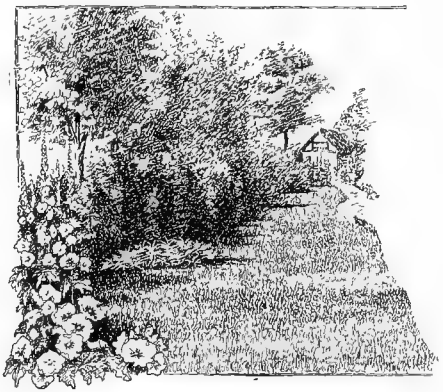

FIG. 110. — Shrubs along a boundary are useful and pleasing. Hollyhock in front.

Shrubberies may be placed at the edge of clumps of trees, or inside the fences that inclose a house-lot. They are of great service along the foundation lines of a building, hiding the cellar wall, rounding corners, making the building seem lower, and altogether making it more homelike. They may be planted to hide the kitchen end of a house, the compost heap, or the clothes-yard. Or a shrubbery may be designed

FIG. 111.— A planting of spiræas to mask a shed. German iris in front.

to inclose a flower garden. Thus it will be seen that shrubs are usually planted to perform some service in making a place beautiful, and are seldom used as being beautiful themselves. This is right, for shrubs are modest things, and should not be expected to stand alone, on show.

The distances apart at which shrubs should stand varies with their size, which differs with the variety. I believe in setting them at the proper distances (about two-thirds of their full spread) from the very first. For shrubs should

be moved as seldom as possible, as you will find if you buy large ones instead of small. The small shrubs, which do not mind transplanting, will grow so vigorously that in a few years they will outstrip those which were well grown when set. It is therefore not wise to put shrubs closer than they are expected to remain, for if moved in a year or two they will suffer, and so will the looks of the shrubbery. Of course young shrubs, planted at full distances, seem for a year or so too wide apart. This can be remedied, if one has enough shrubs, by planting twice as many as will be needed, and then taking out every other one. But nearly as good a method, and much cheaper, is to plant tall flowers, such as larkspur and hollyhock, among them.

In setting shrubs, all broken roots should be cut off clean. The tops should also be pruned somewhat when set. After that, all large shoots should be removed whenever it is seen that their bark is getting rough and coarse. They should be cut off at the very ground, probably two or three of them every year. The younger ones will then replace them, flowering all the better. This, which is nature's way, is a much better method of pruning than to shear them all at the ends. The time of pruning is always just after flowering. The "spring pruning" is therefore injurious to some shrubs, which lose some of their best blossoms when their buds are cut away.

An excellent use of shrubs is for hedges. For this purpose they are planted closely, usually from eighteen inches to two feet apart, and are kept in bounds by shearing or heavy pruning. Good shrubs for this purpose are the Japanese barberry, the California privet (best near the seashore) and the Japanese privet (hardier), rosa rugosa, lilac, Japanese quince, and, toward the South, the box. Of these the Japanese barberry and the rosa rugosa should be pruned, the rest

sheared. Evergreen hedges, which are always sheared, may be grown of the arbor vitæ (the dwarf grows slowly, but needs least pruning) and the hemlock.

Few things about a place, not even the flowers, do so much for its homelikeness as the shrubs. They are quiet, but are comfortable and friendly. Learn to make the most of them.

Review Questions

1. What is the special value of shrubs in relation to a garden? To a place?
2. What kind of shrubs is it easiest for a country dweller to get?
3. Name any shrubs with which you are familiar.
4. How would you make a shrubbery bed: *a.* the soil; *b.* the distances for setting the plants; *c.* the order or system of setting?
5. Is it wise to plant old shrubs?
6. Describe the pruning of a shrub.
7. Tell what kind of hedge you like best.

CHAPTER XXX

Roses

Roses are plants apart. Some few of them are easy to grow, but most of them are shy and difficult, requiring to be grown by themselves. Although shrubby, they are not of any value as shrubs. An exception is the rugosa, which is usually grown as a shrub and not as a rose.

To grow roses properly, one must understand them. First of all, let us study their classes.

Perhaps easiest to grow is the rosa rugosa, a Japanese rose that grows into a thick bush, with delicate single flowers that appear at intervals all summer, and give place to large red hips which make the bush very attractive. The foliage of this rose is its great beauty, being of a rich dark glossy green that is not troubled by either insects or diseases. The foliage of all other roses is too frequently sickly and unattractive. Colors of the rugosa are red, pink, and white. It is treated exactly like any shrub, and makes an excellent hedge.

Next easiest are the climbing roses. These do not really climb at all, since they have no means of holding to a support; but they send out long shoots which can be trained to posts or trellises. Best known is the crimson rambler, but lovelier is the Dorothy Perkins (pink), which is quite as hardy and less likely to mildew. The old-fashioned sweetbrier, while it does not grow so tall, is well worth growing for

its flowers, while the foliage has at all times the delicate odor. All these flower but once, in early summer.

The best garden roses are the hybrid perpetual class, which, like the rugosa and the climbers mentioned, are very hardy. They make beautiful blossoms, coming mostly in June; afterwards scatteringly through the rest of the summer, if each cane is cut off near its base as soon as its flowers have gone. Their colors are red (Ulrich Brunner, General Jacqueminot), pink (Mrs. John Laing, Baroness Rothschild), and white (Frau Carl Druschki, Gloire Lyonnaise). These roses are pretty sure to survive poor treatment, but they will not do their best unless given good care.

FIG. 112. — A spray of climbing rose.

Less easy to grow are the hybrid teas, for though their blossoms are lovelier, the plants are likely to winter-kill. Unless one is willing to give much care, they had best be let alone. Their great advantage is that when once they

have begun to bloom, they will continue all summer, if only each cane is cut mostly away when once its blossoms have

FIG. 113. — A hybrid tea rose, La France.

gone. Good kinds are: in red, J. B. Clark; pink, Killarney, La France; yellow, Maman Cochet; and in white, Kaiserin Augusta Victoria.

These last two classes of roses, the garden roses, need to

be protected in winter. Some gardeners, after bending the roses over carefully, cover them with dry earth, then with leaves or straw, making a cover that will shed rain and will not readily thaw out. Others tie up the roses in straw, and then mound the earth about the foot. Still others make little houses for their roses, usually out of old boxes, filling them with leaves. But none of this should be done until the ground is frozen, and the cover then should be removed in late March, or when the frost is really leaving the ground.

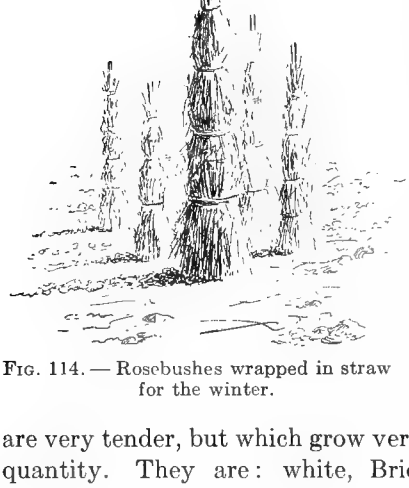

FIG. 114. — Rosebushes wrapped in straw for the winter.

There are other classes of roses, but I will speak of only one more, which should be planted, at least in the North, only by those who so love roses that they are willing to work hard over them. These are the tea roses, which are very tender, but which grow very lovely blossoms in great quantity. They are: white, Bride; red, Papa Gontier; pink, Countess de Labarthe; and yellow, Perle des Jardins.[1]

I do not advise trying to keep these tender tea roses in the ground over winter. In the fall cut them nearly to the ground, lift them, and store them away from frost in moist sand or earth. Keep them cool, plant them out when frosts are gone, and they should yield again.

[1] Of course there are other kinds in all these classes. I merely name the best known. If a reliable florist, having none of them, recommends others in the same classes, there is no reason for not taking his selection.

The other roses may be kept in the ground year after year. Yet some growers lift them every three, four, or five years, prune root and top, and replant in fresh earth.

It is something of a question where to get one's roses. It is simple, but expensive, to buy them. Two-year roots are the best. Or roses of any kind can be grown from cuttings, as described in an earlier chapter. Again, if a branch be bent to the ground and then bent upwards, cutting or breaking the bark on the under side, it will, if buried at the break, held in place, and kept watered, strike strong roots. When cut away from the old plant, it can be planted anywhere.

If plants are bought, they should be "on their own roots." Grafted plants often give the loveliest flowers, but they are very troublesome on account of strong suckers that start from the root, and which must be cut out.

As roses do not do well in a sandy soil, the best earth for them is a clayey loam. And since roses, though so lovely, are among the greediest of flowers, they need to be very well fed. Very well-rotted manure (cow manure is best) should be mixed freely with the loam. Bone-meal is also a good fertilizer, both mixed with the soil before planting, and used as a top-dressing two or three times during the season. The soil should be well drained, for water standing at the roots will soon kill roses.

Roses should be set in soil that is as deep as one can afford. Two feet is not too much, and at least a foot is necessary. Plants should not be crowded, and should be given two feet of space, unless the varieties are very small. Roses do not like to be near other plants, and this is why they are usually grown in beds of their own.

Finally, roses like a little shade each day. Set them, if you can, where they will not get the full heat of the afternoon sun.

There are various enemies of roses. The rose bug must be picked off, the aphis must be sprayed with soap or kerosene emulsion, the leaf-roller must be crushed. When the bloom is over, mildew is likely to appear. Dust the tips of the plants with flowers of sulphur, but best spray, before the blight appears, with Bordeaux or the copper carbonate solution.

You see that the growing of roses, except the rugosa and the climbers, is not easy. Many gardeners try it and give it up. More credit to those who, with thought and work, get fine flowers.

Review Questions

1. What roses are easy to grow?
2. Why is it difficult to grow others?
3. What soil do roses need?
4. What kinds of roses are you acquainted with?
5. Tell what you know of the reasons for some neighbor's success or failure with roses.

CHAPTER XXXI

Vines

Although much to be admired when growing against a school building, vines are seldom grown in school gardens, on account of the difficulty of providing supports. In the home grounds, however, vines may be put to several uses.

The chief value of vines is to soften the outlines of a building, and thus to make it more attractive. They may climb over its sides, or may be confined to a trellis, or may wander over a porch, and, by drooping from it, make it more shady and homelike. But vines may also be made to train over any unsightly object, such as the compost heap, or a pile of stone. Or in narrow spaces they may be made to do the work of shrubs, for when given simple supports to climb on, they will make a wooden or a wire fence into what appears to be a hedge.

The varieties of vines are many, and, as all through this book, I shall speak of only the easiest and the finest to grow. Considered according to their habits, there are three kinds. First come the annuals, which sprout from seed, and die in the same season. Next come herbaceous perennials, which, though they live from year to year, die to the ground each fall. Finally, there are the woody vines, which do not die back.

Some of these vines climb by clinging. That is, some have either suckers or rootlets, by which they can cling to a

flat surface; or else they have tendrils, by which they cling to sticks or wires. Other vines climb by twining. The climbing roses, which do not really climb at all, but rather

FIG. 115. — Vines making a porch shady and homelike.

scramble and have to be tied in place, I have spoken of in the chapter on Roses.

Of the annual vines some are vegetables. These are the tomato, the cucumber, the squash, the bean, the gourd, and the hop. All can be raised from seed in the course of a single season. All are tender, and cannot be planted before the

end of May, but all make strong growth, especially the gourd and the hop. These are rather curiosities than really useful plants; the various shapes of gourds make much amusement, yet the gourds themselves, when dried, can be made into vessels of various kinds. The tomato, cucumber, and the running squash are usually allowed to sprawl in the garden; yet each can be led over a trellis, and can serve as the background of a small plot. The tomato must be tied; the others have tendrils, and will cling. The running or pole beans twine readily up poles or string; they yield a good crop, and the scarlet runner has in addition brilliant flowers. Unless the rows between the vegetables are very wide, the vines should of course be on the north side of the garden, so as to be in full sun themselves, and not shade the other plants.

Other annual vines are flowering. Shortest, but hardy, to be planted as soon as the ground is ready, is the sweet pea. It grows only three or four feet high (the higher it grows, the poorer will be the flowers) and must have some support, such as brush or a trellis. The other flowering annuals are all tender, and

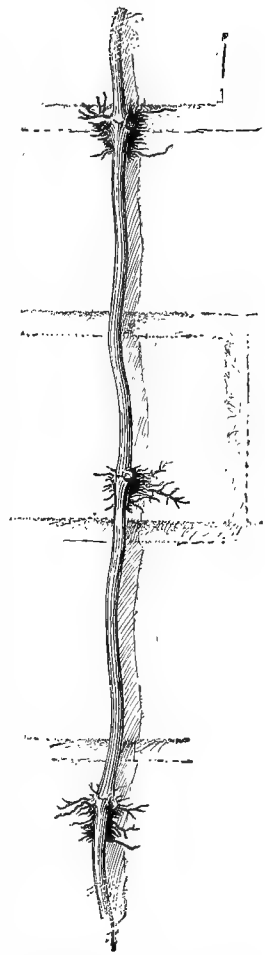

FIG. 116. — The climbing rootlets of the trumpet creeper.

must be planted late in May. Easiest to grow is the nasturtium (the dwarfs do not climb at all), whose colors are very brilliant and whose flowers numerous. It is best to plant groups of the same kind whose colors go well together, rather than mixed kinds. Fairly easy to grow are three other annuals: the morning glory (soak the seeds, after filing or sandpapering the skin, but not at the germ), the moonflower, and *cobœa scandens*. Each of these needs a trellis or strings, six or more feet tall.

FIG. 117. — The morning glory is a tender annual vine.

Easiest to grow of the herbaceous vines is the kudzu vine, a Japanese climber, which, when established, will grow forty feet in a season. It is a twining vine, but needs help to make it cling. It can be raised from seed, and south of New York does not always kill back. Other vines of this class are the cinnamon vine, a twiner that makes a rather thin foliage, and the Madeira vine, another twiner, whose flowers resemble the mignonette. The tubers of these last two must be bought, and are not expensive; but while the cinnamon vine is hardy, the tubers of the Madeira vine must be lifted before the ground freezes.

The woody perennials do not die to the ground, but grow

taller year by year, until their stems are often, at the base, bigger than a man's arm. Nine of them are worth any one's growing.

Most famous is the English ivy. This climbs by clinging rootlets, and will cover almost any building in the course of time. Its close, dark green foliage is beautiful and dignified.

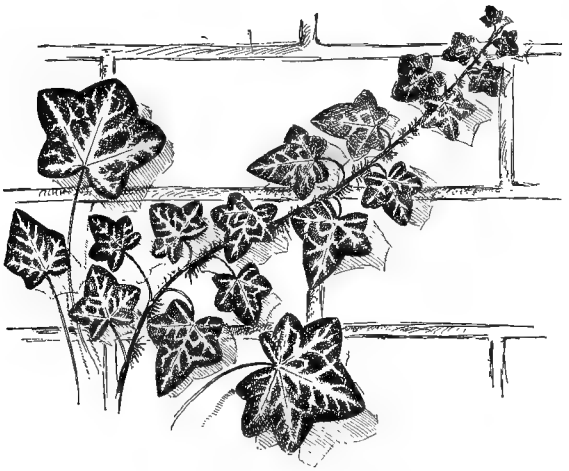

FIG. 118. — English ivy is the finest vine where the winters are mild. Notice the rootlets.

But it has two disadvantages. It is slow to establish itself, the shoots sometimes dying in the first year or two, unless protected from the winter's sun. And it is not truly hardy much north of New York City.

Euonymus radicans, or spindle vine, cannot really pretend to take the place of ivy except in one particular. It is evergreen. Either of these two vines is green, and therefore very beautiful, all winter. But the euonymus does not grow

much taller than ten feet high, and though its growth is very thick and glossy, it cannot do the same service as the ivy.

The remaining vines all lose their leaves in winter.

Boston ivy, or Japanese ampelopsis, is used to take the place of the English ivy north of New York City. It is very hardy, will climb quite as high as the other, and has beautiful close leafage, which is attractively colored in the fall.

FIG. 119. — The Virginia creeper is a useful hardy vine.

Of the same family, and climbing by the same method, by tendrils and suckers, is the Virginia creeper. It grows rapidly, trains well, but does not cover so much space. Neither of these vines bears flowers.

A fine-flowering vine is the trumpet creeper, *tecoma radicans*, which bears orange flowers in summer, often flowering from July to September. It grows about thirty feet high, by means of rootlets. In some localities it becomes a troublesome weed. The Chinese variety, *tecoma grandiflora*, has larger flowers. Both are hardy.

The clematis is an easily grown vine, climbing by means of its petioles or leafstalks, and therefore needing a support. It grows to the height of twenty feet. Easiest to grow is the Japanese *clematis paniculata*, which in late August forms

masses of small white and sweet-smelling blossoms. The pods which follow these are also attractive. There are large-flowered clematis of two colors, deep violet (Jackman's clematis) and white (Henry's clematis). But the vines of these are not so close-growing.

The honeysuckles form a family of vines of which the Japanese is easiest to grow. One of its varieties has a gold-yellow flower (*lonicera Japonica reticulata*). Very well known in this family is the woodbine (*lonicera periclymenum*). The honeysuckles do not grow taller than twenty-five feet, but are very hardy, and stand drought well, or do well in light soil. They climb by twining, and therefore need support. Their flowers come in summer.

A very early flowering vine, and one which also has a fine foliage, is the wistaria. It is sometimes

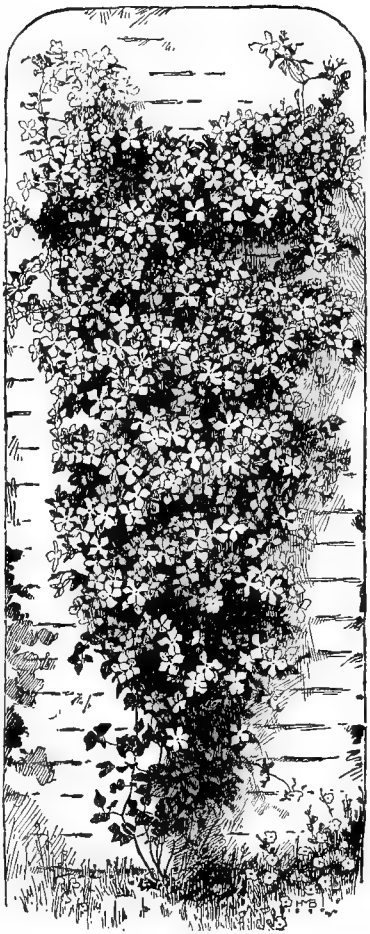

FIG. 120. — The large-flowered clematis.

difficult to establish, the reason I name it last; but when once it is growing well it is probably the finest vine that we have. Its flowers, in long, drooping spikes, are lovely and fragrant in early spring; its foliage is clean and plentiful.

FIG. 121. — The Chinese wistaria is beautiful when in flower.

The best kind is the Chinese, with white or blue flowers. It is very hardy, and will climb, by twining, to the height of a hundred feet.

These are the best woody vines for the beginner to grow,

although others (actinidia, akebia, bitter-sweet, Dutchman's pipe, and several more) may be chosen by one who is familiar with them and can easily get the plants. None of these nine vines can be easily grown from seed, but from a nurseryman a root of any of them can be bought for less, often much less, than a dollar. To these vines can be added the grape, which may be admired quite as much for the beauty of its foliage as for its fruit. It climbs by means of its tendrils, and will go high enough to cover any ordinary arbor or porch. Used as a cover, the wild vines are very beautiful, and are considered by some to give the best grapes for jelly. Or the cultivated grapes can be used. Grapes can be raised from cuttings, as explained in a previous chapter.

The annual vines may be planted in the ordinary soil of the garden, but the perennial vines ought to have as good preparation as for a tree or a shrub. A hole as wide and deep as the gardener can fill with good food (with manure, compost, and good loam) is none too good for them.

The support for the vine is according to its nature. Those which climb by means of suckers or rootlets need no trellis, but can grow on brick, stone, or wood. Those which cling by twining, or by tendrils or petioles, should have a trellis of some kind. For the annual vines, strings are good enough. Tie them to pegs in the ground, and lead them to the top of the wall or fence. But for vines that are to live for years, the support should also be lasting. They should be of wire on iron frames, or of some durable wood. Cypress is the best. Sometimes trellises can be bought to suit the place where the vine is to go; but usually it is wisest to have the trellis made for the place. A boy who is handy with tools can make, out of cypress, a trellis that is better than he can buy at any store. But it should be put in its place firmly, using screws or bolts rather than nails. For vines become heavy, and, when wet,

or when pulled at by the wind, drag very strongly at their supports. Trellises, or wires, should not have openings that are very small, lest the vine should not have room to grow.

In the small garden plot there may, after all, be no room for vines. But the gardener who has a little more room, and who wishes to have something grow, like a wall, between him and the street, may well use vines of some kind, even if he uses only the annuals. And one who has the chance to beautify his home should call vines, as well as shrubs and flowers, to his aid.

Review Questions

1. What is the special use and value of vines? What three kinds are there? How do vines climb?
2. Name any annual vines that you would like to grow.
3. Which of the perennial vines have you seen? Describe a satisfactory vine growing in your town.
4. Describe the kinds of trellises you have seen.
5. Which vine would you most like to have growing on your house? How would you support it?

CHAPTER XXXII

The Fruit Garden

I do not intend to discuss in this book the orchard fruits, but shall keep to the kinds which young people can set out and care for themselves, and which will yield quickly. Further, I shall speak of only the common kinds of fruits and berries.

Easy to cultivate, and best in yielding, is the strawberry. It is usually planted in the vegetable garden, in rows, and in good ground should remain but two seasons before it is dug up. The plants can be most conveniently set in pairs of rows, two feet apart, or less, and eighteen inches apart in the rows. Once set, there are two methods of taking care of them.

The first, hill culture, is simple. When once they are established, strawberry plants send out runners, to make new plants. In hill culture all these are cut off as soon as they appear. Each plant then forms several crowns, which in the second year make many berries.

Matted row culture is different in allowing the plants each to set runners (that is, to allow them to root) until the whole double row is covered with plants standing about nine inches apart. This must be carefully regulated by the gardener, who should fix the runners in place by stones, pegs, or handfuls of earth, so that they shall be properly spaced. Otherwise the runners will crowd in some places, leaving others bare. When once the row is filled, all new runners should be cut off. Each plant will now form a crown, which will make next year's berries.

For hill culture, the paths between the pairs of rows should be two feet wide; for matted rows, three feet, counting from the centers of the outer rows.

Each method has its advantages and disadvantages, and the yield is about the same, though the hilled berries are larger. The hills require more care in cultivating and pruning, the matted rows in weeding. When the bed has fruited once, it is either dug up, or very carefully weeded, and

FIG. 122. — Strawberries, matted row culture.

every old or spotted or red leaf plucked off. Some gardeners merely mow with a lawn mower, but the hand work is best. The bed should then be fertilized, and tended as before. In fertilizing a matted row, sow the fertilizer when the plants are dry; then go over the bed with a broom, and brush the chemical from the plants.

Strawberry plants may be bought of dealers at two seasons of the year. The first is early spring, when the plants have not yet started. Only young plants should be accepted; the roots will not be stiff and wiry. The second season is

midsummer, after the growers have allowed runners to root in pots sunk in the beds. The potted plants are wrapped in paper, and carefully shipped. There is no reason why home gardeners cannot set new beds from old ones, even without

FIG. 123. — Young strawberry plant, with many soft roots. These should be trimmed, as here shown.

FIG. 124. — The broken runners from the crown, and the hard wiry roots, show this strawberry plant to be old.

the use of pots, by carefully lifting the young plants with a trowel, taking plenty of earth.[1]

The choice of varieties is usually pretty wide. They classify first as early, medium, and late-season plants, and every garden should have some of each. Then there are two

[1] For directions for setting strawberries and other plants, see pages 268 and 269.

other classes of plants, perfect (or staminate, those which have stamens as well as pistils, and can make fruit without help) and imperfect (or pistillate, those which have pistils but no stamens, and therefore need staminate plants near by to help them make fruit). The imperfect yield some of the finest berries. It is not possible to recommend any of these varieties by name, since old ones die out and new ones are bred every little while. Again, different ones do better in different districts; and, finally, the kind of soil is important. In choosing varieties you should therefore consult some gardening neighbor, or the nearest dealer in plants, who will consider both your soil and your district.

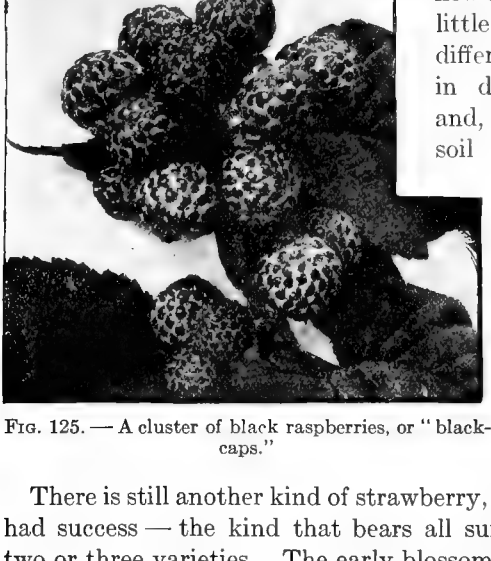

FIG. 125. — A cluster of black raspberries, or "black-caps."

There is still another kind of strawberry, which has recently had success — the kind that bears all summer. There are two or three varieties. The early blossoms should be picked off, and the plant kept from blooming until the ordinary strawberry season is past. Then the fruit, coming late, is much appreciated. But these kinds cannot yet be said to bear fruit as good as the common strawberry.

The other plants of which I shall speak do not yield as quickly as the strawberry. Often they do not bear a good

crop until the third year. But on the other hand they are all long-lived.

The raspberry follows the strawberry next in the garden

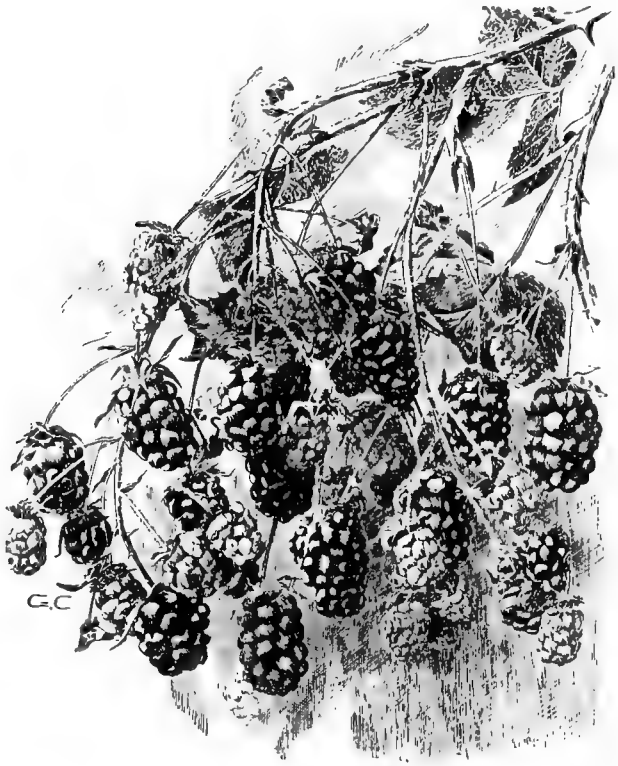

FIG. 126. — A spray of blackberries.

year. Raspberries grow differently, having a root set deep underground, and sending up shoots year after year. Once set, the bed will not give out for a long time. The varieties

are early, medium, and late, and had best be selected by local dealers. As soon as a cane has borne once, it should be cut at the ground. Do not let too many new shoots start; they will starve each other. Raspberry canes should either be tied to wires, or cut off at about two feet from the ground. They will then send out side shoots, which the cane can support. If disease gets into either the crown or the leaves, the sickly plants should be cut out. If the whole bed is infected, it should be dug up, the plants burned, and new ones planted in another place. Do not plant them within a dozen feet of wild plants, for fear of root disease.

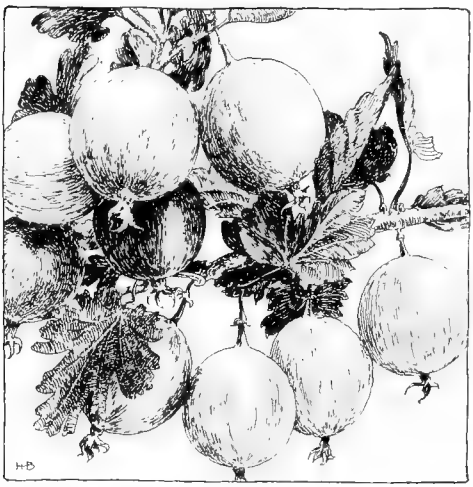

FIG. 127. — The larger gooseberries are worth growing.

Raspberry rows should be planted six feet apart, the plants two feet apart in the rows. Treat black raspberries just like the red.

Blackberries are treated in almost every way like raspberries, except that they should be in rows nine feet apart, the plants three feet in the rows. They grow very freely, and send up many shoots, most of which should be cut out.

Currants are still another kind of plant, growing like a small shrub, and treated in much the same way. Set them four

feet apart. When a branch has borne once or twice, and is getting woody and coarse, cut it out. New shoots will replace it.

Gooseberries are growing in popularity, since better kinds, larger and sweeter, are being bred. They yield more freely than currants, over a longer season, and should be treated much the same. Be sure to get kinds which do not mildew in your locality.

With both currants and gooseberries watch for the currant worm, which appears in late spring, usually on the lower part of the branches. Poison him with hellebore.

FIG. 128. — Grapes yield well with little trouble.

Grapes are the latest berries of all, and are in some ways the best, at least after the strawberry. There are many kinds, and one should have at least one early, medium, and late kind, to make the season longer. They should be set nine feet apart, and every spring should be carefully pruned before the sap starts. Cut out most of last year's growth, leaving from ten to twenty young buds to make the wood for the new fruit.

FIG. 129. — A fair crop of quinces.

All of these berries can be grown by any boy or girl, to yield while the owner is still a boy or girl. Others (the mulberry, the wine-berry, the logan-berry) can be added to the garden. And even the larger fruit can be added. Apples, pears, cherries, and other such fruit, which are usually grown on trees, if *grown on dwarf roots* yield fruit a year or more after planting. They are not too high for proper tending, and under good care will make handsomer fruit than the full-sized trees. The trees must be bought, and should be planted and tended like any shrub. Cut out all branches that interfere, and do not let the fruit stand nearer than six inches apart. Then there should be a yearly yield. The culture of dwarf fruit trees is not yet very popular, but the trees add much to the garden.

Quince, which grows on a small tree or a large bush, according to the way it is trained, is always worth growing, but its growth is slow. Try it in shrub form, and treat it like any shrub.

In all cases the care of fruits should be much like that of the vegetable garden. Fertilize in spring with potato fertilizer, or bone-meal and wood ashes. Cultivate after every rain, and let no weeds grow. In August, sow a cover-crop of crimson clover, and in the spring dig it into the ground.

At first the beginner will be slow in venturing to grow fruits. But in many gardens a plant or two can be planned to go into odd corners, to add a little variety to the yield of the garden. And after that the way is open to growing more.

Review Questions

1. Describe the two methods of cultivating strawberries.
2. How does the raspberry plant differ from the strawberry?
3. Do blackberries and raspberries resemble each other? What difference is there in the way in which they are planted?

4. How do you prune currants? What new kinds of gooseberries are interesting? What should we beware of in choosing our gooseberries? What is the pest of both currants and gooseberries?

5. In what way can we grow the larger fruits most quickly?

6. What berries and fruits would you like to grow? Prepare a plan of the fruit garden that you would enjoy planting.

CHAPTER XXXIII

Garden Tools

We can scarcely work the garden without tools. Let me at the beginning advise particular care in their choice. They should, on the one hand, not be too big or heavy for the worker's strength. A boy or girl working with a tool meant for a man will find it much too heavy and clumsy, and will get so tired that gardening will soon seem stupid and unprofitable. On the other hand, the tools should not be too light, which usually means flimsy. It is waste of money to buy such tools. Gardening is most satisfactory when the tools are "just right." Don't use men's tools, therefore, and, on the other hand, don't be satisfied with the first set of child's tools that is offered at the grocery. Go to the hardwareman and ask for better tools, and if he cannot help you, go to the florist, or the seedsman. If you hunt long enough, you will find what you want, strong but light, and neither too big nor too small.

Although such tools will cost a little more than cheap ones, yet they will outlast them many times, and their number need not be great. Indeed, in a very small patch, after borrowing a spade or fork for an hour, we can get along with a short pointed stick. New York City children in the poorer sections cultivate their little gardens, which are only about five feet by ten, entirely with sticks which the children themselves shape and sharpen. They can be used to loosen the earth, to dig out weeds, to make furrows for planting.

For bigger gardens, however, and even for little ones, it is well to have more tools in order to do the work faster and better. I propose to speak of them in connection with the sort of work that is to be done with them.

For digging the ground we need a spade, or a fork. Digging the patch to the proper depth is often called spading, and the fork a spading or digging fork. Very excellent little spades, usually called boys' spades, can be bought, suitable for boys or girls or women. Some people always dig with the spade; for my own part, I seldom use the tool except to dig a hole from which I wish to remove the earth. For making the earth ready for planting, I prefer the fork, since it breaks the soil into finer lumps than the spade. But if you get a fork, get a good one. The best kind has a strap ferule, that is, a ferule with bands running up both the front and the back of the handle to strengthen it. If the tool is not so fortified, the handle is likely to break. The tines are flat.

Some people prefer a manure fork for spading. It is usually made of very good steel, and the tines can be shortened to any degree. But its handle is usually much longer than a boy or girl can easily manage, and I find the round tines too far apart for satisfactory digging.

For planting and cultivating, entirely different tools are required. These are the rake and the hoe. Hoes of all weights can be bought, and every one can suit himself as to weight or length of handle. The best hoes have blade and ferule all in one piece, and the ferule is riveted to the handle. With heavy hoeing on rough or weedy ground the tool will not come apart. Rakes have separate ferules, since their work is lighter. Their teeth should be not less than an inch and a half long, and the whole rake may well be no wider than a hoe. For in a small garden we may wish to have the rows of small plants, like radishes, as close as six or nine

inches apart; and a full-sized rake cannot get in between the rows for cultivating.

The cultivating tool that I find altogether the best is the so called weeding-hoe, which is a combination of rake and hoe. It is not so entirely convenient for digging out a deep furrow as is a real hoe, since the earth falls through its openings and back into the furrow. But it will open a shallow furrow very satisfactorily, is perfect for covering seeds or for raking, and if when raking one comes across an obstinate weed, the rake is turned upside down, a stroke of the hoe-blade cuts the weed, and then one can go to raking again. If I could have but one cultivating tool in my garden, it should be a weeding-hoe.

For marking out the garden, and for planting, one needs a line and stakes and labels. The line may be any piece of strong string of sufficient length. If you wish it to last long, dip it in melted wax. Extra strong, non-kinking line may be bought at the seedsman's. The line may be wound on a stick, kite-string fashion; I never do anything else. Or you can buy or make a kind of reel on a stick that is very satisfactory, although I think it clumsy for anything except a very long line. You need two sticks, of course, the second for the end of the row; over it is looped the string. Labels may be only short sticks to mark the ends of planted rows in gardens so small that the owner can easily remember the kind of plant and the date of planting. But for larger gardens it is not well to rely on the memory. Make the labels flat and smooth at the ends, and dip these in white paint. Then you can write on them the variety planted, and the date. Labels had best be an eighth of an inch thick, in order to come safely through accidents. The very thin ones that one buys at the seedsman's will, if stepped on when hidden by leaves, snap in an instant.

A basket of some kind is almost a necessity for even the smallest garden. Whatever size or shape it may be, it is useful in carrying seeds to be planted, in bringing the crop to the house, or in receiving the weeds when one is cultivating.

FIG. 130. — Compare the seedsman's labels, lying across the others, with the heavier ones made at home from a bunch of laths. Which would be better in the garden?

Like the labels, it had best be strong; but the flimsiest basket, if carefully used, will do much service.

In a large garden no basket will do all the necessary work of carrying weeds, rubbish, and stones, away from the garden. Then one must get a wheelbarrow. Like the spade or hoe, this must be chosen according to the strength of the worker. A man's-size barrow is much too large for a boy, even for small loads; and if the work is to be done with any comfort,

a smaller barrow should be got. But it should be well made. Its frame, at least, should be of hardwood; the wheel also. The axle should be strong, and running in well-made, firmly fastened bearings. In other words, the barrow should not be a toy.

If you have no barrow, but instead a well-made little express wagon, it will do almost as well. And of course, if you have something to begin with that is good enough for a while, it is wise to be content, making plans, however, for something better some day.

A watering-pot, or a share in one, is necessary at times. We shall wish to water seeds after planting in dry ground, or the seedlings when struggling in a drought, or larger growths which have just been transplanted or are beginning to flower. In school gardens a watering-pot will serve several children. At home, if you have nothing better, a pail will do if only you pour from it with great care not to wash the soil. Pour into the hand held close to the ground, and let the water trickle through the fingers. But of course the pot is best. Get a good one if you can. Galvanized ones last the longest, but even if we have them, they should be carefully used. They should never be left with water standing in them, for that causes rust. It is best to leave them turned upside down, so that every drop of water shall drain out.

FIG. 131. — Your trowel should be strong.

In addition to such tools as these, which are frequently necessary, a trowel is very hard to do without. True, the spade will take its place in digging a hole, but it is heavy and clumsy to use with one hand. The trowel is a valuable tool for use in transplanting. Most gardeners use the curved trowel, but I always use the middle or large-sized mason's

trowel, with the more rounded point. After what I have said about strong tools, you will not be surprised when I add here that a light-weight trowel, that will bend or snap easily, is not worth buying. That is one reason why I prefer the mason's trowel; it is usually very strong.

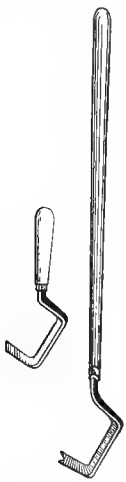

FIG. 132. — Weeders.

Other tools than these you can very well dispense with, but there are some that are worth having. Weeders, for example (there are many kinds and shapes), will save the fingers, although they will never do as good work. Small hand-forks, or other tools for scratching the ground when you are on your knees before the garden-bed, are convenient. Many people use dibbers, which are short-pointed sticks as large round as a man's thumb, for making holes for transplanting, or even for lifting plants. I must acknowledge that I have never used one, since it seems to me that a trowel is better for both purposes. But you may find them very handy.

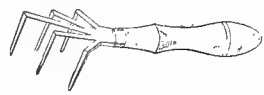

FIG. 133. — The finger-weeder.

FIG. 134. — Dibber.

Other larger tools can be had for cultivating, and every little while some one patents and sells a new one, which is supposed to be better than the old-style hoe or rake. Most of them are, however, no improvement on those ancient tools, which were invented with the dawn of civilization, and which men have used ever since. There are two implements, however, of which you should know.

One is the push- or scuffle-hoe, a hoe which has a blade which the user pushes before him. This tool has several forms, but they all work alike. The blade, resting on or just beneath the surface, cuts every weed, and leaves the surface properly broken up. It is good in soil which has no stones, and is very handy for killing weeds under overhanging bushes. But in stony soil it is a dangerous tool, since a thrust, turned aside by a stone, may kill a valuable plant instead of a weed. In stony soil a "pulling-hoe" (see Fig. 136) is better.

FIG. 135. — Push-hoe, without handle.

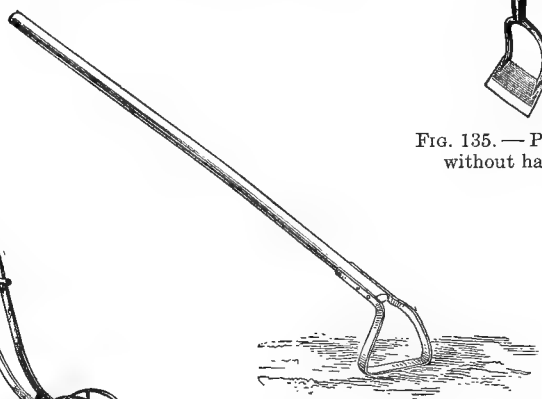

FIG. 136. — A "pulling-hoe," homemade.

FIG. 137. — Wheel-hoe.

The other tool is the wheel-hoe, which is a labor-saver for workers in large vegetable gardens. Behind the wheel, or wheels, may be fastened hoe-blades, rakes, cultivator teeth, and even little plowshares, which do their work as the gardener pushes the tool before him while walking between the long, straight rows. The work of cultivating a vegetable

garden is much lightened by such a tool, which may be had in several shapes and sizes, even small and light enough for a twelve-year boy or girl.

Planting machines are of use in vegetable gardens of much size, but again the soil must be free of stones. If the tool keeps striking stones as big as one's fist, the plants will come up in very wobbly lines. These tools are expensive and complicated, and are usually too heavy for children.

If your garden is so small that you will be able to sift the surface earth over your seeds, by all means get a sieve. An ordinary ash sieve will do, but you can make a finer one by taking the top and bottom from a shallow box, and tacking on some common fly-screening.

It will be helpful if you mark on the handles of your hoe and fork the measures that you are likely to use in the garden. Three, six, and nine inches, and then the feet and half feet up to a yard, are quite enough.

And, finally, keep your tools in good condition. First, clean every one when you have finished with it. Caked dirt on the handle will blister your palms, and earth on the blade will make it rust. An unrusted tool will last much longer, and, again, it will do its work better. Try working with a rusty trowel, and see how troublesome it is to have the earth stick to the blade. Then try a clean tool, and see how neatly it does its work. Tools cannot properly be cleaned by washing; they will rust if not wiped dry. Clean them with dry earth, or sand; or else with a piece of wood, or the hand. Simply rub off the clinging soil.

When they have been cleaned, hang your tools separately on the wall.

Tools need not be many, but they should be good ones, light and strong. A good gardener is known by his garden, to be sure; but we can find out something about him if we notice how he keeps his tools.

Review Questions

1. What kind of tools should one buy for gardening? Are yours satisfactory or not? Why not buy men's tools? Or toys?
2. What kind of a ferule should your fork have? Why?
3. Describe your hoe. Your rake. How should you like to change them?
4. How few tools can you get along with? How many should you like? How could you justify the extra expense?
5. Why should you clean your tools after using? Why put them away?

CHAPTER XXXIV

Preparing the Soil

We have wisely settled the position of the garden without taking into account the present condition of its soil. If it is too wet or too dry, too sandy or too clayey, we will change all that. Still less ought we to be afraid of a good soil that appears to be full of weeds, witch-grass, or stones, or which just now happens to be covered with rubbish. These are much easier to change than the nature of the soil itself.

First we set to work to clear the surface of all loose things. We divide them into two classes. Tin cans, old wood, stones, and rubbish of all kinds, should be put forever out of the way. If there is a stone wall near by, chink it with the stones. Wheel all the rest to the rubbish heap. In case there are no such conveniences as wall and rubbish heap, dig a deep hole in the garden itself, and pack the rubbish into it. To do so, break all glass and earthenware, and flatten the tins. Pack the rubbish carefully, and stamp it down as compactly as possible. The top of the rubbish should be eighteen inches underground.

The second class consists of those things which will easily and quickly rot. Leaves, dead grass, vines, anything of the sort, should be carried to some out-of-the-way place, preferably a shady one, and there piled. At the end of a year these dead and now useless things will begin to form the best of soil. Call the heap the compost heap, and on it put every-

thing of the same sort. All weeds, pea-pods, stems, and dead plants should be cast here. Prevent anything from sprouting on the heap, unless of your own accord you plant on or near it squashes or vines to cover it and make it sightly. If you do this, or if you keep the heap neatly squared and flattened, there is no reason why you should not have it in full sight. And then, whenever you are in need, you can go to the compost heap as to a bank, and draw out good soil for your garden.

While you are beginning this pile, you should decide whether the grass on the garden ought to be cut also, and stacked there. Short grass, or small weeds, may readily be dug into the ground. But if they are very long, then they had best go to the pile.

Next comes the question, must the soil be drained? If, on digging in the early spring or soon after a rain, you find that water stands in a hole eighteen inches deep, and will only slowly drain away, then probably you have a hardpan or clay subsoil, and the land ought to be drained. Or if you go out after a heavy rain, and find that over the whole garden, or on parts of it, the water stands in puddles for some hours, then pretty surely the garden needs draining.

This, to be properly done, is a work for men. The work is heavy. But if the garden is not very large, and your courage is good, you can do something at it yourself. In the back of the book I put an explanation of how this is done.

But perhaps you wonder why we drain the land. If drains lead the water away, how are the plants to live, especially in time of drought? Well, we shall be doing to the garden only what we did to the potted plant, in leaving a hole in the bottom of the pot. The drains can never lead all the water away, since the soil holds much by capillary action. Drains merely take away the water that stands too high in the soil.

When this has been done, the soil is warmer, and the plants can root deeper. Then when a drought comes, the deep roots, boring for water, can well supply their plants, while shallow-rooted plants are not prepared for the sudden loss of their supply.

Once the soil is drained (and mind you, most soils have a subsoil that does the work already), the loam is to be dug.

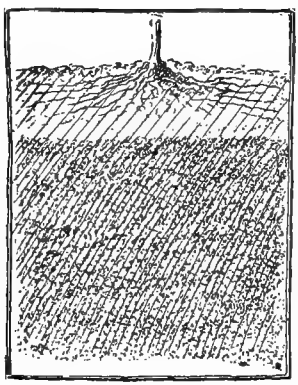

FIG. 138.

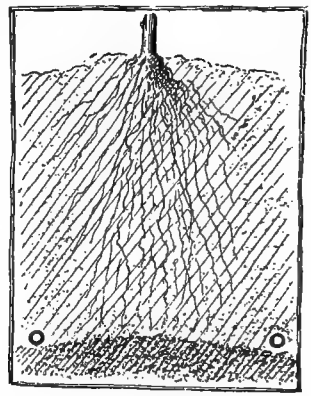

FIG. 139.

In undrained land (Fig. 138) the roots are shallow. In drained land (Fig. 139) they are deep. Explain the reason, and the advantage.

It is true that for a garden that is to last for a number of years, the soil ought to be trenched. In the back of the book I explain a good method of trenching, which can be practiced by any one with success. But it is hard and costly work, and most of us avoid it.

Ordinary digging, or spading, which comes next, should be properly and carefully done. A large garden is usually plowed. A small garden, however, must be spaded, and in most parts of the old world people still spade all their gardens. In fact, it is usually a better method than plowing.

There are two ways of doing it. One consists in simply lifting the earth with the spade or fork, and dropping it again, turned over, on the spot from which it was taken. The other consists in moving the whole top "spit" (that is, the top soil to the depth of your spade) of the garden six inches or a foot in one direction, at the same time turning it over. This is the best method, as I shall presently show.

FIG. 140. — Thrusting in the spade. Let your weight do the work.

But before we study the exact method, just a word or two about the use of the tools. A spade or a fork will take up more or less earth according to the angle at which it is thrust into the earth. Compare a boy who is thrusting his spade straight down, with one who is pushing his at an angle away from him. The first is digging deeper. Yet he does not have to lift any heavier load of earth at a time than the other: that depends on the thickness of the slice of earth that he makes. And again, when

you yourself thrust in the spade, note how much more easily it will go into hard ground if you use it corner-wise. Finally, be careful in spading to use the weight of your body rather than the muscles of your arms. If you must push the spade into the earth, you will soon tire; whereas if by simply leaning on the spade you do the work, you will last much longer.

The action of spading, then, is as follows: Your tool should be so tall that you can adjust it for the thrust while standing upright. Set it in position, then place your foot on top of the blade of the spade, or on the shoulder of the fork. Now, leaning forward slightly, throw your weight on the tool, and thrust it to its full depth. Next, while still almost upright, pry on the upper part of the handle and break the earth loose. Now slide the lower hand down to the very blade of the tool, still prying on the handle with the other. You are ready now to lift the spadeful of earth with the least exertion. Lift it, turn it over, and drop it. If the dropping does not break up the lump, strike it with the blade of the spade, or the tines of the fork. You will soon learn how to pulverize it with the fewest blows. One ought to be enough. Now stand upright, and get a moment's ease while adjusting the tool for the next thrust.

In spading the whole garden, I do as follows: Having imagined the garden to be cut into a series of strips, from four to six feet wide, I spade across the whole of the first strip, dropping the forkfuls, not on the spot from which they were first taken, but nearly a foot farther away from me. I have thus made an open trench, four to six feet wide, and about a foot deep.

Into this open trench I drop the next forkfuls, taking them one by one along the face of the trench, and leaving another trench where they were taken. Thus as I continue to spade, I move each forkful of soil a foot forward, and at

the same time the trench moves backward, until the strip is finished. At the end of this bit of work there is a little narrow trench at one end; and at the other, where I began, there is a little ridge. But with cultivation both of these soon dis-

FIG. 141. — Keeping the trench open. This is the best method of spading.

appear. I then go back to the starting place and begin my second strip, taking pains, as old gardeners say, to "keep the trench open."

The advantages of this method are very plain. With an open trench one very soon sees if the spading is deep enough. The soil is not merely lifted and dropped, a method which can become very slovenly, so that many lumps are left covered and unbroken; it is moved to another spot, the face

of the trench, where lumps are easily seen. Anything that will decay can be buried in the bottom of the trench. If one is spading in manure, or is turning sod, the open trench shows exactly how the work is being done. The manure can be left at just the right depth, leaving the fine earth above for a seed bed. Or the sod is dropped in the bottom of the trench, face down, making it very hard for the roots to strike. I have in this way dug under a crop of rape standing eighteen inches tall, laying it deep in the trench, so that by the time the roots of the next crop reached it, it was already rotting.

Again, spading with the trench open allows us to get at the subsoil. If this is very hard by nature, or has been closely packed, it will be a good plan to loosen it. Make the trench as wide as you conveniently can, and as often as it is finished anew, thrust down the spade through the bottom and into the subsoil. You will often have to use the spade cornerwise, and even to have your cuts criss-cross each other, in order properly to break up the subsoil. Each time the spade is thrust well down, pry the slice loose, and then leave it; or you may even lift it, turn it, and drop it back. The latter is hard to do without mixing with the loam some of the gritty subsoil.

There is one more advantage to the trench, which is discovered as soon as the worker tries to spade a piece of land that is full of witch-grass, sorrel, or other perennial roots that will need but a week to sprout again. There is only one way to do such a job properly, and that is to get out every root. If the soil is merely dropped in the place from which it was lifted, many of the roots are covered and not seen. If they are strewn on the face of the trench, they are detected at once.

Here shows the superiority of the fork over the spade in digging sod-land. With a close sod, the fork more easily tears

the roots apart. And when the object is to get out the roots, the fork is a great help. After lifting the forkful of earth, the loam is sifted down through the tines of the fork, the roots are left, and these are easily tossed on to little heaps which the worker makes every yard or two, and which may be collected afterward. Or if roots fall through the fork on to the ground, they are easily lifted with the tool, to pile

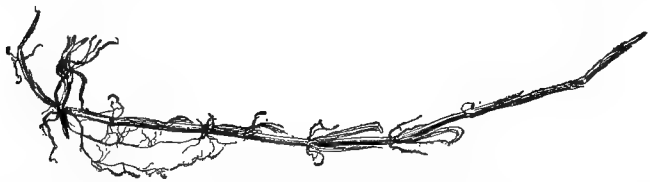

FIG. 142. — A root of witch-grass. In spading, take out every one of these.

with the others. With the spade one has to stoop farther, and lift the roots with the hand.

Of course, it is wise to take out every stone as large as a hen's egg. Pile them, to carry away later.

Spading, properly done, is not an easy task. To get the greatest possible depth, to keep the trench open, to take out all the roots that will sprout again, and all the stones, is a painstaking matter. And if this is not done, what is the result? A badly spaded garden looks, when finished, just as well as a well-spaded one; but one sees the results in midsummer. The roots have not been able to penetrate into the unspaded ground, the plants have not so much food or water, and the yield is poor. There has been a hard fight with the perennial weeds. Since it is always too late to remedy this with the present crop, the only thing to do is to spade thoroughly at first. Yet I have never found it an uninteresting task. If I hurry, nothing tires me more. But if I take and keep my proper pace, with a moment of ease between every two

thrusts, I am always interested in the brown earth that is giving up its secrets before me, enjoying its mellow crumbliness, its odor, and the knowledge that the work is good.

So much for spading a garden of which the soil is satisfactory. But we do more than this with a poor soil. There are three conditions that one is likely to meet: extreme lightness, which means a dry soil; extreme heaviness, which means a wet and late and cold soil; and sourness, which means that most plants will have a difficult time. The remedy in each case is to work in something to improve the ground.

For a very light soil, as for a very heavy soil, the remedy is the same. This sounds like the story of the man who warmed his fingers and cooled his porridge by blowing from the same mouth; but in each case the tale is true. A good dressing of manure will make a light soil hold more water, as we know by our winter experiments. At the same time the light and loose particles of manure will keep the clay soil from sogginess by providing drainage and letting in the air. There is one more thing that we can do to the heavy soil, and that is to spade in a good dressing of coarse sand or sifted coal ashes. These separate the fine particles of the clay, and make the soil drier and warmer.

To apply manure to the garden seems very simple. We simply spread it in a layer as thick as we can afford (from two to four inches is a good dressing) and spade it in. But there are two things to remember. In the first place, the manure should be spaded completely under. If you can do it in no other way, lay the manure in the bottom of each trench before the next is made. In the second place, it should be of the right kind. It should be of horse manure, or of horse and cow manure mixed; less than half of its volume should be bedding; the bedding should be straw or

leaves, and not sawdust, which is slow to rot and makes the garden sour; and, finally, the manure should be as well rotted as you can get. Well-rotted manure shows itself not at all as a mixture of bedding and manure, but as a dark, finely shredded substance, pretty light in weight. The nearer it is to this, and the less it looks like fresh manure, the better it is. You see it must not have been allowed to "burn" (in this case its color is light); it must have been kept moist, and it must have been turned and mixed many times before it is in the best condition for the garden.

For a sour soil we provide lime, putting it on after the garden has been spaded. This not only makes the soil sweet, but also makes clay more open in texture, and sandy loam more close. It comes in many forms, of which the commonest is quicklime, or stone lime, which should be laid out on the soil in little heaps, and allowed to slake. When it has all fallen away into powder, spread it over the whole garden. The amount should be at the rate of *at least* a pound for every five square yards. Or buy the lime already air-slaked, and use twice as much. On heavy soil use more. These are the best and surest forms. Other kinds are agricultural lime, gas lime (which is no longer very well thought of), marl, basic slag, and wood ashes. But as the quality of all of these varies greatly, be sure that you find out from the dealer how much lime they contain per pound. Any of them should be scattered on the surface of the ground after it has been spaded, and then should be raked in.

After spading comes the raking. This should not be solely for the purpose of breaking lumps. The fork has done most of that, and the surface should be rather finely grained, but of course irregular. The rake now makes everything smooth. It breaks the smaller lumps, takes out here and there a weed or a root that has escaped the fork, it levels, and it

leaves the whole garden a perfect seed bed. But mastery of the rake is not easy. One must learn to rake deeper or shallower, according to need, by lowering or raising the handle. One must learn how to fill hollows by pushing or pulling, and even by using the back of the rake. One must train one's eye to know when the surface is evenly graded. And, finally, one must not be satisfied with anything short of a "good job."

One more thing every gardener should know, and that is how to use the hoe. I speak now of preparing a large surface which has already been spaded, or plowed, but in which weeds have sprouted. Since spading is here not needed, the hoe is the weapon to be used, and it is used in a particular manner. With the rake one works backward, leaving behind a perfectly smooth surface. But with the hoe one must work forward, and tramp on the ground that has been worked on. This is because of the nature of the tool, and there is no escape from it. We begin, as with spading, by imagining the garden cut into strips, and we hoe them one by one. Advancing from the very edge of the bed, we slice the whole surface with short, sharp strokes. This action moves the earth toward us, so that when we have finished with a strip, its whole surface has moved a little in the direction from which we have come. We cut to the depth of two inches or more; a skillful and determined worker will slice to the full depth of his blade. As we go we take pains to cut every weed at or below the surface of the ground, so that when severed from its root it will die. The work is easier, we soon shall find, if we strike, not with the whole edge of the blade, but with one of the corners. We shall be wise, also, to sharpen the edge, from time to time, with a coarse file. We shall discover that much of the work can be done by the weight of the hoe in falling, and that we shall not have to lift it very high. But

every now and then a stout weed will need a higher lift and a harder blow. Every little while, as we move forward, we should turn, and with a stroke or two loosen up the soil where we have stood. The straighter we stand, the easier the work is, except that to bend forward a little is natural in hoeing.

After such work the rake must of course go over the ground. There will be weeds to gather and wheel away, and the whole surface to be fined and leveled. In a large garden the wheel-hoe smooths quickly, after the weeds have been taken away.

A valuable addition to the home garden is a seed bed, a patch that in many cases need be only a few feet square. Since it is chiefly for the raising of seedlings until they are large enough to be set in the open ground, and since usually only such quick-growing and shallow-rooted plants as lettuce, cress, and radish are allowed to grow to full size in it, the loam need not be more than a few inches deep. But the surface must be extremely fine, and should be carefully worked over with the rake until the very smallest lump is broken. Indeed, it is quite worth while to sift the upper two inches of the surface through an ash sieve, to make sure that it is fine enough. The lighter and warmer the soil is, the better it will be for the purpose. Any manure that is worked in should be extremely well-rotted. Besides all this, the seed bed should have full sun, and protection from the cold winds.

One of the most discouraging things is to discover that because of some carelessness or haste in spading, the garden is still full of witch, or quack, or piper grass. This, with its many rootstocks, speedily sprouts and occupies the ground. The best remedy is to spade again, slowly taking out every root. The next is to hoe every few days, cutting every spear that shows itself. After a month the soil will be free of the grass. But in case the garden has been planted,

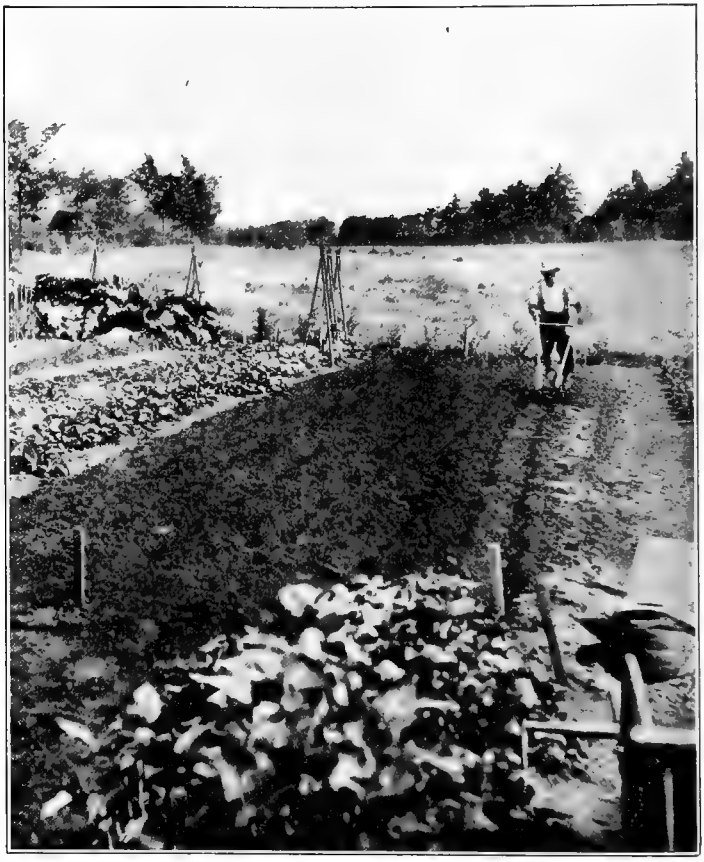

FIG. 143. — Wheel-hoe leveling the soil which it has just plowed.

the only thing to do is to disregard the present crop, and to kill every root that sprouts. Take a trowel, and on your hands and knees dig out every one. It is tiresome work, but it pays. Three times thus I went over a potato patch

where the witch-grass was thick. Each time the work was easier, and since then no witch-grass has appeared in the garden. And although I must have dug through every hill, the potatoes yielded well.

FIG. 144. — A seed bed nursing transplanted tomatoes.

The lesson of such an experience is that it pays to prepare the soil properly. Few things are more important in gardening. And when, with spade or fork, with hoe and with rake, the garden has been worked over, there is great satisfaction in the sight. After the waiting of winter, few things are pleasanter to look upon than a garden ready for the seed —

especially if we have done the work ourselves and know that it has not been skimped.

Review Questions

1. Do you need to drain your garden? If so, how will you do it?
2. Explain the use of the fork or spade in digging.
3. What is meant by "keeping the trench open"? This is not the same as trenching. Can you explain the difference? (See Appendix.)
4. Is spading easy? When does one find the difference between a well and a badly spaded garden? Why not earlier?
5. Explain the difference in the way of using the rake and the hoe.
6. What is a seed bed? What is its value?
7. Tell how to kill bad perennial weeds, such as witch-grass.

CHAPTER XXXV

Planting

On the first day after the garden is ready, if the soil be not too moist, we are likely to wish to begin the planting. This may be proper for perennial roots, but for seeds the objection is that we may be forcing the season. There is sometimes a little difference between the time when the ground is ready to be worked and the proper time to plant. Watch the old gardeners in your neighborhood, and see if they are at work. Remember that you will not lose much by waiting a day or two till the weather becomes settled. Heavy frosts, or a cold, rainy week, might do much damage. The later planted crops will nearly catch up with the earlier; while if the early planted ones fail, the loss is considerable. Remember again that there is no real hurry in planting the whole-season crops: a few days in the fall makes no difference whatever; it is with the short-season crops that we are usually in a hurry. Finally, distinguish carefully between the hardy and tender crops. You can plant sweet peas and radish very early in the spring, and frosts will not do them serious hurt; but nasturtiums and beans must wait till the danger of frosts is past.

Thus you see that for your planting you must make a time-table as well as a plan. Study the table in the Appendix.

When you begin, follow the garden plan. If it was made to measure, you can by means of it locate every row, or every group, exactly.

Next, consider how deep each kind of seed is to go. While indoors and in the frames we planted pretty shallow; out of doors the seeds go deeper. At least an eighth of an inch is the shallowest that I recommend for out of doors, except in the case of the wettest of soil (in such soil always plant shallower) or of very delicate seeds, of which my planting table will warn you. The larger seeds are always planted deeper than the little ones, so that by the time you get to the lima beans, they may go nearly two inches deep. But again, in very wet soil the depth should be less, say an inch. Besides these depths of coverings, I always scatter over the seeds a little loose earth, to dry into a dust-mulch and prevent the soil from drying or caking.

Let us now consider the different ways of planting seeds. The commonest method is in rows or drills, in the vegetable garden or the flower border. For this a line must be carefully stretched (tightly, so that it shall not sag or sway) and below it the earth must be dug, with the corner of the hoe, to the proper depth. As I always find it difficult to dig just beneath a string, I usually set the line a couple of inches to one side, and make my furrow parallel with it. This must be done with much care, especially for small seeds, since the depth should everywhere be the same.

Into the furrow the seed should be dropped. To do this properly is delicate work, since the distances should be regular. Sift the seed out of the corner of the envelope; or, holding the seed in your palm, shake it out sidewise. If the wind is blowing, you must hold your hand low, or the seed will be lost. With valuable seed, such as cauliflower or petunia, it is well to set each one just where it is wanted. But the number of seed that is sowed out of doors should be more than if sowed in the house. There will be greater loss, from drought or frost or cutworms, and we must have

enough plants left to grow. Sow twice as many as in flats (or consult Appendix D for information about vegetable seed); set the smallest every eighth of an inch, with peas and beans almost touching each other. This seems extravagant sowing, and in a good year will mean much thinning; but in a bad year such generosity may save the crop.

Now carefully, with the hoe or with the back of the rake, scrape the earth back into the furrow. This again is a delicate task, for it should be distributed evenly.

Next, press down the earth over the row of seeds. This is so that the moisture of the earth shall get at the seeds quickly. The work can be done by tamping with the flat face of the hoe, or by walking along the row, tramping every inch of it.

As I have said, I never consider the planting finished until with the rake I have drawn a little loose earth over the drill. By keeping the earth from drying or baking, this greatly helps the sprouting of the plants.

Such is ordinary planting. But I like to add one more direction — the putting of fertilizer where the seedlings will quickly find it. This is easily done by making the furrow, at the very first, an inch or two deeper than for the seed. Into the furrow I strew the fertilizer which will be best for the plant,[1] taking care that none of it falls above the level where the seed are to go. I do this generously, a good handful to every yard. Then I cover the fertilizer with care to the proper depth, and sow the seed. The rootlets will soon find the food that is waiting for them.

Sowing in hills may be simple or complicated, just as we are hurried and skimpy, or leisurely and generous. If hasty, after stretching the line, we plant seeds in little holes at the

[1] See chapter on Chemicals.

proper distances and depths, cover, pack down, mulch, and leave them. This leaves at each spot several seeds crowded together where but one, or a few, are to stand.

A much better way is to loosen the earth afresh at that point, and then to take out the upper few inches. Into the soil thus uncovered, dig fertilizer, or (since plants that are to go in hills need food to grow vigorously) a generous spadeful of compost or well-rotted manure. Cover with a little earth, and plant the seed, not close together, but over a circle as large as a dinner plate. To guard against accidents, plant twice as many as you will need. Cover the seed, firm the earth, and mulch the place.

The planting of flower seed may sometimes take different forms from any of this. Some flower seeds are very tiny, and need to be merely scattered on the soft earth, pressed in, and mulched. The distances are seldom to be measured exactly, but with the aid of the plan may be spaced by the eye. The depth should be carefully studied and accurate, and food of some sort should be placed beneath, unless you are sure your garden is very rich.

One thing should always be remembered in the planting of seed, and that is that the spot should always be marked. At the ends of rows set stakes or labels, on one of which should be marked the name of the plant, and the date of sowing. I prefer to do this in pencil on a common shipping tag tied to the stake; the writing will last all summer; but the envelope on which the seed came may be used for the purpose, if only it is secured against blowing away. This is in case stakes are used. With real labels, write on the wood. These memoranda will not only remind us of the kind of seed planted, but will serve as a guide and a warning when we wish to work in the garden before the seedlings are up.

The planting of tubers, such as potatoes and dahlias, is

a somewhat different matter. They should, to begin with, be separated from each other if they come in clumps. Next, if they are large and have more than one bud, or eye, they may be cut into pieces, each piece having one eye or more, with as much as possible of the starchy matter. These may now be planted separately. Three inches is the least depth at which they should be planted, and generally four is better, unless the soil is very damp. Make the earth rich beneath them, cover, firm, label, and mulch.

FIG. 145. — Seed-piece of potato, ready for planting.

To plant bulbs requires a somewhat similar process. Bulbs should not go into wet ground, and if the earth is pretty moist, each should be set upon a little bed of sand, put at the bottom of the hole. The depth varies with the kind of bulb, but should always be *enough*, in order to stiffen the stalk which is to carry the heavy flower. Generally speaking, bulbs should be covered to at least three times their height. Be sure to set them right side up; the bottom can be known by the scar of separation from the parent.

The setting of perennial roots should by this time be a simple matter, if one has first practiced on seed, tubers, and bulbs. To begin with, since the plant is to stay in the same place for years, the ground should be made as rich as possible. Compost, manure, and slow-yielding fertilizers, such as bone-meal, should be dug into the earth to a depth of two or three feet whenever possible, taking out the subsoil for the purpose, and filling in with loam. The more thoroughly this is done at the first, the better will be the yield, but fresh manure should never be allowed to come near seed or bulb or root. In this earth the root should be set at the distance to which it was originally buried. This can usually be found by study-

ing the stalk. The root may be fibrous, as with the Japan iris, blackberry, and most shrubs; or it may be tuberous, as with the German iris and peony; but in any case no air spaces should be left. The earth should be packed in snugly around and among the roots; it should then be watered, in order to settle it well. Then mulch the place and mark it.

Strawberries need a few directions to themselves. It is important that the crown of this plant should be set just at the surface of the ground. Therefore the plant should neither be in a little hollow, into which soil can wash, nor upon a little hummock, from which soil can wash away.

And, finally, whatever seed is to be planted, or root is to be set, thoroughness and care are very necessary. As with the digging of the ground, the finished work looks just the same at first, whether it be well or badly done. But when the summer tests the work by the growing of the plant, then the careless or hasty or skimpy gardener will see, by the poor growth, that it would have paid him to do the work well.

Review Questions

1. Why is it not always safe to plant in spring as soon as the ground is dug?
2. Compared with planting in flats, how deep do you plant out of doors?
3. Why do we need to use a line in planting vegetables?
4. Explain how to plant in rows. In hills. Why label the plantings?
5. Tell how to plant tubers. Bulbs. Perennial roots.
6. Explain the setting of a strawberry plant.

CHAPTER XXXVI

The Seedlings, Outdoors

When once our seeds are planted, it would seem as if we should merely need to glance at the garden once a day, to see if the little plants have appeared. But even the time of waiting has its cares.

In the first place, the weeds will sprout. Now a weed has been called a plant in the wrong place, so that a vege-

Fig. 146. — Seedlings of lettuce.

table in the flower garden, or a flower in the vegetable garden, is a weed. But there are plenty of useless plants which will appear in either place, and which ought to be twitched out as soon as they are big enough to seize upon. The difficulty sometimes is that until the lines of seedlings

appear, we cannot tell which are the weeds. The lines from label to label will help us sometimes, so that if a plant appears between the rows, we can take it out.

In the second place, sometimes there is rain. Now rain packs the ground firmly, and as soon as the sun comes out, the moisture begins to dry out of the ground. We know, having studied it in the winter, that a loose covering of dust will prevent drying. Of course if we rake up the whole

FIG. 147. — SEEDLINGS OF CARROT.
At first they look like spears of grass.

surface, we shall get this dust covering, but we may also disturb the seeds. If we can depend upon the labels, then we can cultivate between the rows. A vegetable gardener here has an advantage over the flower gardener, for his straight rows of seeds may be avoided. The irregular planting of the flower garden will not allow us to take such risks except in a few places where it may be perfectly plain where the seeds are.

What we can do, therefore, before the plants appear is very little. But when the ground cracks above the sprouting seeds, then we may prepare to come to the rescue. Some-

times it happens that the surface has caked over the seeds. The little plants, struggling all together, are able perhaps to raise the caked surface a little; but the earth weighs them down, and only a few of them may be able to get through. Then the gardener, working very delicately with the points of

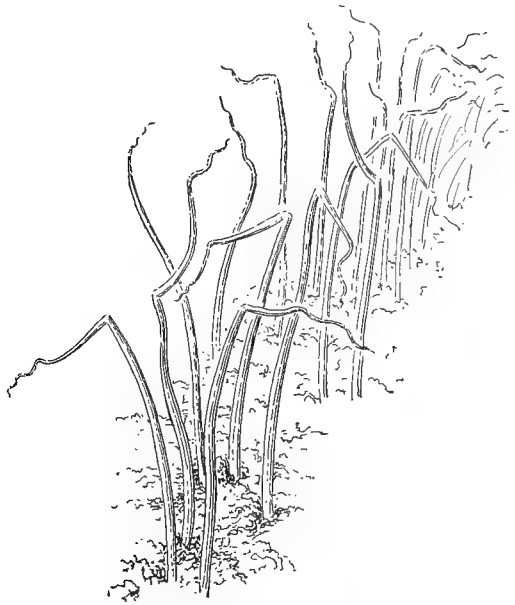

FIG. 148. — Seedlings of onion are hardy.

a fine rake, or best with the tips of his fingers, crumbles the caked earth into dust. This falls among the little plants, and frees them.

And now that the plants are up, we are anxious to have them grow. There are three things that we can do to help: we can cultivate, we can fertilize, and we can thin.

Cultivating I have already mentioned. It is the work of

making the dust blanket over the whole garden as soon after a rain as the ground can be raked. This time varies with the kind of soil. On a very light soil we can begin almost as soon as the rain has stopped; the heavier the soil the longer we must wait, until on very heavy clays we may have to wait a whole day, or even more. What we must wait for is to have the surface in such condition that it will easily crumble when scratched with the rake. If we try to work the clay soil too soon, it will merely pack or cling to the tool. But if we wait until the right time, it will easily break up into little lumps which the rake immediately makes finer.

There is more than one way of doing this. On a small garden the rake ought to be used, and nothing else. The earth can be scratched to a depth of nearly two inches. If at first it does not break up fine, leave it as it lies until the whole garden has been raked, and then begin again. The sun or the wind has by this time dried the little lumps, so that at the touch of the rake they will fall into powder.

If the soil is very stubborn and heavy, and yet is so dry that it will not cling nor cake, the hoe may well be used first. Do not cut deeper than about two inches, and let the surface wait until the lumps have dried. Then the rake will pulverize the whole.

If the vegetable garden is very large, the wheel-hoe ought to be used. It will save time. Put in first the cultivating teeth; five of them come with most machines. Go up and down through all the rows and break up the whole surface. Then change the teeth to the rakes (there are usually two with a cultivator), and go over the whole again. When you are finished, there will be a fine dust mulch on the garden.

The work is delicate, and is especially so at first. You must work as close to the little seedlings as you can without

uprooting or covering them. It takes skill to do this, for it is difficult not to go too deep, or not to throw the earth toward the plants. As the plants grow the work is easier, for the ground which they shade need not be cultivated, and so there is less surface to work. Yet as the plants are bound to grow irregularly, there will be many odd corners to be cultivated which it takes skill to get at. That is why

FIG. 149. — Corn is a summer delicacy. Plant plenty of it.

the best gardeners, who take pains in working thoroughly and well, prefer to use the rake rather than the hoe or cultivator, and also a narrow rake rather than a wide one. One advantage of the rake over either of the other tools is that since the gardener works backward, no footprints are left.

Once the garden is cultivated, — and *well* cultivated, with a real dust blanket stretching into every odd corner, and so thick that no moisture can evaporate through it, — it can be left alone until the next rain, or until the weeds start. When the weeds show, pull or hoe them. The push-hoe is valuable

here, but in a large vegetable garden the worker may put the hoes into the cultivator, and so cut off all the weeds, as he cannot with the teeth of the rake.

Fertilizing of the seedlings is done usually by either nitrate of soda (sulphate of ammonia is just as good) or by liquid manure. Scatter the dry salt lightly alongside the seedlings, as close as you can without touching them. Then water the plants, washing the fertilizer into the ground. If you sow the salt before a rain, that is better still. Or if you wish to

FIG. 150. — Lima beans are among our tenderest vegetables. Plant late.

do otherwise, dissolve some of the salt in water, a level teaspoonful to a quart, and pour it in furrows made alongside the rows. In making the furrows, do not disturb the roots. Fill the furrows full, and let them drain; then cover with dry earth. The same treatment is used with liquid manure.

It will help your vegetables, and even your flowers, if in early summer you scatter on the ground between the rows the fertilizer that is proper for them. Cultivated in, and carried down by, the rain, the food is found by the foraging roots. See pages 101 and 102.

Thinning the seedlings must be done as soon as they begin

to crowd. Any one can tell when they stand much too thickly; but in order to know just how far apart plants should stand, study the planting list. Then thin the plants courageously to the proper distances. It needs courage to do this, for many fine plants must often be taken out and thrown away in order that the others may have room to grow.

FIG. 151. — Thinning should be careful — and courageous.

Some vegetables, such as lettuce or beets, can be left at half distances, or can even be thinned but slightly, if the gardener intends to pull and use them as soon as they are a little bigger. But they should not be allowed to stand long enough to stunt the plants that are to remain.

In thinning, it is wise to determine just which plants shall remain, and then take away all others near them. Be sure to get every one, so that the work will not have to be done again, and so that there will not be crowding after all. Be careful not to twitch out the good plant with the poor one, as may happen if they have stood so long that their roots are intertwined. And if you have

loosened the soil very much, or made holes, press back the earth again with the fingers, and brush a little dust over the place, so that it will not dry out.

Only one danger is likely to further assail the young plants, and that is frosts. If you think one is coming, protect the seedlings overnight. This may be done by spreading cloths or lawn clippings over the plants, or even by raking the earth over them. Then in the morning the cover must be removed. If you have covered with earth, the cover must often be brushed off with the fingers, a tiresome process. But it is better to do this than lose the plants.

Danger from insects I shall speak of in another chapter. But if you see a plant cut off, dig near by for an inch or so. You may find a curled caterpillar which has caused the trouble.

The care of young plants requires, as you see, some attention and some thought. Do not suppose it can be skimped, or that it can be done in a hurry. Make your garden both your business and your pleasure, work slowly at it, and it will pay.

Review Questions

1. Why do you often want to work in your garden before the seedlings appear? In such a case, what can you do?
2. How can you help the seedlings when they are up?
3. How do you cultivate? How fine is your mulch? How deep?
4. Have you a wheel-hoe? Do you wish one? Why?
5. Explain your method of fertilizing.
6. Why is thinning necessary? What is your method? How can we avoid much thinning of beets and lettuce?

CHAPTER XXXVII

Transplanting

Transplanting is needed with most plants raised in the house or the frames, and is also needed with some which, growing in the open garden, are so plentiful that they can be lifted and set elsewhere. Transplanting is not difficult if only the gardener will remember to water the plants well before and after setting.

Setting out from pots is very simple, and is not hard on the plants. They should be freely watered two or three hours beforehand, not merely so as to wet the earth, but *so that the plants themselves will be filled with water*. This should be done always in transplanting. Water the plants well, therefore, and give them time to take the water in. The rest of the transplanting is merely like repotting, but is simpler. Tip up the pot, holding the fingers across its top. Tap on the bottom, and the plant should fall against the fingers. Remove the pot, and if the roots are very numerous and crowded, loosen them a little. Then set the ball of earth in the ground at the right spot, pressing the earth firmly around it. Water it once more, then mulch and leave it.

One thing remember in all the work of transplanting: Press the earth firmly around the plant, but *not too firmly*. The roots must not be injured, nor should the earth be packed so tight that the roots cannot spread.

Transplanting from a pot is practically sure to succeed, be-

cause the root is not injured. But in taking up from a flat or the row plants that are four inches or more tall, the roots are sure to suffer. Treat them, therefore, very carefully.

In the first place, water them freely, so that they will be full of water. This will help them through the struggle that is to come. Give them time to drink the water in.

Then, while they are drinking, prepare the ground to receive them. If the ground is not rich enough to suit you, dig the holes (I always stretch the line a few inches away, parallel with the true line, so it will not be in the way) deeper than the roots of the plant will at first go, and then work into the ground manure, compost, or fertilizer. If the ground is very dry, pour in water also, and let it drain away.

FIG. 152. — Use a line for setting plants.

Now go to the plants, and lift them carefully. Perhaps they stand so far apart that you can lift them separately. Do it with a trowel, or even with a shovel or a spade, taking all the earth that you can. Carry the plant to the hole, sift in a little earth until the depth is proper, and set the plant immediately. Then water it, and when the surface has dried out, scatter dry earth over it.

If the plants are crowded, so that you must lift several at a time, lift only a trowelful, set them, and return for more. But if the place where they are to be set is at a considerable distance, so that you must lift them all at once, shade them until you set them. It is a good plan, in such a case, to

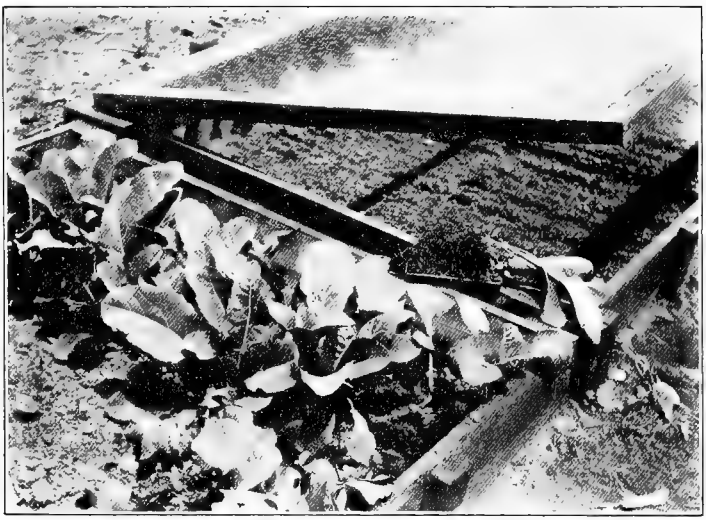

FIG. 153. — If possible, take with each plant a trowelful of earth.

carry them in a box, into which you pour water, so that they wait in mud.

Separating such crowded plants should be done patiently and delicately. Tear the roots as little as possible. If any are much injured, throw them away and take plants with better roots. The root is more important than the top.

In setting small plants, thrust the finger, or the hand, or a trowel, or a dibber, into the soft ground and make a hole to the proper depth. Lower the roots of the plant into it,

until it is at the right height. Then press the earth around the roots.

Here shows one disadvantage of the dibber: roots set by it are sure to be crowded. Trowel-set roots can at least be spread like a fan. The larger the plants, the greater the advantage of the trowel.

FIG. 154. — Using the dibber to press the earth against the roots.

The proper depth is not hard to determine. With such plants as young asters, or lettuce, which have a crown from which all the leaves spring, set this crown just at the level of the ground. But with plants whose leaves spring from a stalk, such as zinnia or tomato, the plant may be set at almost any depth, even two or three inches deeper than before. Then the roots are deep, and are not likely to dry out. This kind of plant may also be set in a little hollow, made with the hand. This is of use on future days in watering; it holds the water and leads it directly to the roots. But plants with a crown cannot be set in such hollows, which will fill up with earth and cover the crown bud.

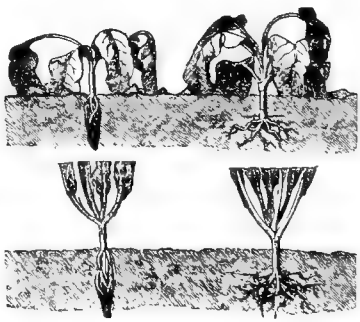

FIG. 155. — UNSHEARED PLANTS ABOVE, SHEARED PLANTS BELOW.

See also the crowded roots of the dibber-set plants, to the left. Are the spread roots better?

Since plants which have lost some of their roots will have a hard time supporting all of their leaves, it is wise to remove some of the leaf surface. Some do this by clipping or tearing off the ends of all the leaves; others tear off some of the leaves entirely.

The watering after setting should be thorough. The quantity to be given depends upon the size of the plant. Do not pour on so much that the roots will be washed out; but wet the ground deeply.

As soon as the surface has somewhat dried, cultivate it, or scatter on it dry earth.

In order to keep the plants from wilting, they must often be protected against the sun for a day or two. Watch them; it may not be necessary to cover them, but do it if they begin to wilt. And if you are to leave them for several

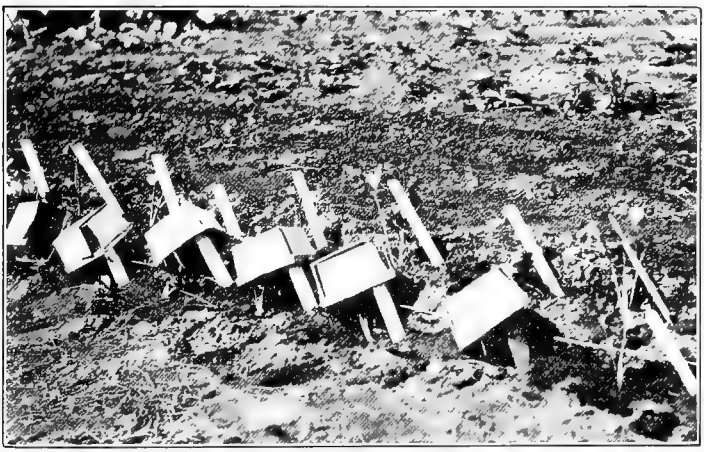

FIG. 156. — Strawberry boxes, held up by labels, over newly set plants.

hours on a hot day, be sure to cover them. This may be done by means of flower pots, old strawberry boxes, newspapers held in place by stakes, or broad pieces of wood, such as shingles, stuck in the ground to the south of the plants, and slanting over them.

Do not leave the cover on all day. The plants must learn

to take care of themselves. Therefore do not cover them before nine o'clock, even on a hot day. And uncover them as soon as the sun is halfway toward his setting.

If you do a little thinking over what I have told you here, you can easily make two rules that will help both you and the plants through the struggle of transplanting. They are as follows:

On a sunny day, wait till late afternoon before transplanting.

If there is no hurry, wait for a cloudy day, or just before a rain. The rain will do half the work for both you and the plants.

For protection against cutworms, wind a strip of paper (a *collar*) loosely around the plants when setting them. Let it extend an inch above and an inch below the surface.

One help you can give to your plants, but not until they have begun to grow again. Fertilize them, lightly, with nitrate of soda or liquid manure.

The work of transplanting is an interesting one, and no other makes a gardener so skillful with his fingers. Some folk, when gardening, use gloves to protect the hands; but with very small plants one cannot transplant with gloves on. Take them off, and go at the work with bare fingers. Enjoy the feel of the soil, learn to handle the plants delicately, and be the more friendly toward them. You will like the work, and will like, too, to see the plants presently thriving again. One or two may die (and you will be wise to reserve a few to fill gaps), but most will live to reward you.

Review Questions

1. Why is transplanting necessary?
2. Name one great aid in transplanting.

3. Explain setting out from pots. Why is it likely to succeed?

4. Explain setting out from the frame or seed bed. What care do we take of the roots? Why? What do we do to the tops? Why?

5. How do we know at what depth to set a plant?

6. Describe a method of protecting newly set plants from the sun.

7. What plants do you expect to transplant, and how will you do it?

CHAPTER XXXVIII

Plant Enemies

Gardening would be too easy if plants had no enemies but the weather. Insects and diseases keep us properly awake, and give us exercise for our wits.

Insects, first, are equally troublesome above ground and below. They may be classed as chewing and sucking insects, or again as hard-bodied and soft-bodied insects; and according as they fall into one class or another they may be fought.

Fig. 157. — The potato bug is a chewing insect.

Some fine morning, for example, you find here and there on your currants, on your potatoes, not leaves, but just the midribs of leaves. You look closer, and find that there are troops of caterpillars, or slugs, or perhaps striped bugs, at work, rapidly eating the leaves. You have found the currant worm, or the potato bug or his children. Or again you find holes drilled everywhere on the leaves of your tomatoes, and discover that they are made by little black shiny beetles, very small, which jump when you try to touch them. You have found the flea-beetle. Or the leaves of your roses are curling or wrinkling, while on the under part are groups of tiny, pale, soft bugs. These are aphis, members of a great and very active family; they are sucking the juices of the plants.

If your garden is small, probably the simplest thing to do

is to pick off the insects, or the leaves which hold them, and drop them into a can which holds a little water, on top of which are a few teaspoonfuls of kerosene. But if the garden is so large that the work of picking is too great, you must go about the work differently.

For chewing insects, spray the leaves with a poison which will kill the insects.

For sucking insects which are soft-bodied, such as the aphis, spray them with a liquid which will kill them on touching them, a "contact insecticide."

In order that you may understand this better, I must explain how to spray, and how to make poisons or contact insecticides.

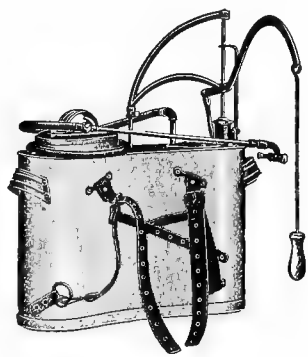

FIG. 158. — A knapsack sprayer is best for large gardens.

To spray is to scatter very thoroughly, but very thinly, over a plant, a liquid which will practically reach every part of it. In a small space you can do this by means of a whisk broom, repeatedly wet and whisked over the plants. This is the first method ever used, but is slow and wasteful. At the seed stores you can buy, to do the work more quickly and economically, spraying machines of all sizes. Atomizers are good for small plots. Best for larger plots are knapsack sprayers (*not* the "compressed air sprayers") of good makes. Get the seedsman to pick out a good one for you, have it if possible of brass or galvanized iron, and remember that in sprayers "the best is the cheapest."

Spray every part of each plant, except the blossom. If possible, spray in sunny weather. Always strain the mixture before putting it into the sprayer.

The best poison is arsenate of lead, since it does not injure the plant, and sticks well. Paris green is not, for both these reasons, so good. Buy the arsenate in jars, and mix it with water according to the printed directions. A good poison for plants that are to be eaten, such as currants and cabbages, is hellebore, which presently weakens and washes off. Dust it on when the plants are wet with dew; or mix it with water, and spray it on.

FIG. 159. — The bucket pump is simple and reliable.

Mark all these as Poison, and keep them where young children will not find them.

Contact insecticides are of several kinds. Easiest to make is the soap solution. Get whale-oil soap, or even a good laundry soap, and whittle shavings from it. Dissolve these in hot water, about a quarter pound to a gallon for caterpillars, or weaker for aphis. To make a still better insecticide, dissolve a half pound of soap in a gallon of water, and to it add two gallons of kerosene, shaking the two together, or in some way churning them, until they are a creamy mixture. This is kerosene emulsion, and when made well will keep well. To use, mix one part with ten or fifteen parts of water.

Tobacco dust, or tobacco stems, make a good contact insecticide. Use the dust as an insect powder, sifting it or blowing it against the insects. Or steep the stems in boiling water, and spray the liquid on the insects.

Such is, simply, the work of fighting insects above ground. But there may easily come puzzles that are hard to solve. The flea-beetle and the rose-bug do not chew, and so cannot be poisoned; they are hard-bodied, and do not mind the spray. Luckily the arsenate of lead is unpleasant to them, and they leave the plants which are sprayed with it.

Again, we cannot spray flowering plants, for we destroy the blossoms; and we do not like to discolor their leaves. For insects on flowering plants, such as asters, we should therefore pick by hand, or protect by fine netting.

It may prove, when a plant shows weakness, that insects have entered it at some point or other, and are eating the pulp. This happens to the squashes, and to some few other plants. The remedy is to cut out the insects by slitting with a knife, or to kill them by thrusting a wire into the hole. Cover the slit squash-vine with earth.

Squash bugs lay their eggs, little shining brown beads, on the under surface of squash leaves, or on leaves that overhang the plants. Occasionally they lay the eggs on the upper surface. Keep a watch for them after summer begins, and as soon as you find them, go carefully all over the plants, and tear off the leaves, or the parts of leaves, that hold the eggs. Then crush, or burn them, or soak with kerosene. You will save yourself much trouble, and greatly help the vines.

And one thing is to be remembered of all plants, or parts of plants, that have been pulled on account of the insects or diseases that they may harbor: *they are not to go on the compost heap.* For there the eggs may hatch, or the bugs live over winter, or the disease live on, so that next year the compost heap will bring trouble to the whole garden. Burning is the best thing for all such plants.

Below ground the chief pests are grubs, aphis, maggots, and cutworms, all soft-bodied; and wire-worms, hard-bodied. The tiny aphis and maggots, which are numerous and very hard to find (they work on cabbages, the apple, and other plants), can be got at by pouring quantities of kerosene emulsion about the roots. It should be plentiful, but not strong. The fat white grubs and the thin wire-worms may be found by digging at the roots of weakened plants,

perhaps three or four inches underground. Sometimes, when a grub has killed a plant, he may be found on a straight line to the nearest living one.

But the cutworm is the worst underground enemy. He lives underground, but comes out at night and cuts plants close above the surface. In order to prevent this, on land which is to be planted with a specially nice crop, such as asters or tomatoes, *bait* for cutworms *before the plants are set.* To do this, mix together bran, molasses, and arsenate of lead or Paris green, to make a sweetish, sticky mass. Put bits of this everywhere over the ground. Then when you set the plants, *give them collars.* That is, wrap loosely about the stem, for an inch both above ground and below, a thickness of paper. Newspaper will do, but brown paper looks better. The cutworm will not cut through this. Collars can be used even on plants which have no stems, such as lettuce or young asters. If cutworms injure plants which have been grown from seed, scatter the bait again, but also dig for the villains. They can often be found, tightly curled up caterpillars, close under the surface near the plants which they have killed.

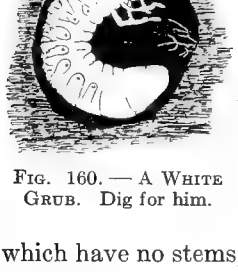

FIG. 160. — A WHITE GRUB. Dig for him.

A general remedy for all plant enemies that spend the winter in the ground (cutworms, grubs, wire-worms, rose-bugs) is to plow or spade the garden very late, just before winter. The pupæ or the larvæ will be broken from the snug cases which they have made and will often be killed by the winter.

Diseases are sometimes much more troublesome than insects, mostly because we allow them to get started, and they are hard to stop. The best way is to prevent their beginning.

On such plants as are subject to disease (see the planting list) spray early according to their needs. The chief sprays are Bordeaux mixture and ammoniacal copper carbonate (used because, unlike Bordeaux, it does not discolor leaves or fruit). Besides these, flowers of sulphur, dusted on, is good against mildew.

Bordeaux mixture is best bought, unless the gardener is to use a large quantity. (It can be bought in various quantities, either pure, or mixed with poison.) If it is to be made at home, the business is rather complicated. In a wooden or earthen vessel put five gallons of water; then hang, just below the surface, a cloth bag holding a pound of copper sulphate, until the sulphate has dissolved. In another vessel dissolve a pound of quicklime in warm water until the mixture is as thick as cream. Strain this milk of lime through cheesecloth into the first vessel, and mix thoroughly. Add water to make ten gallons. The mixture will keep. The recipe can be divided by five.

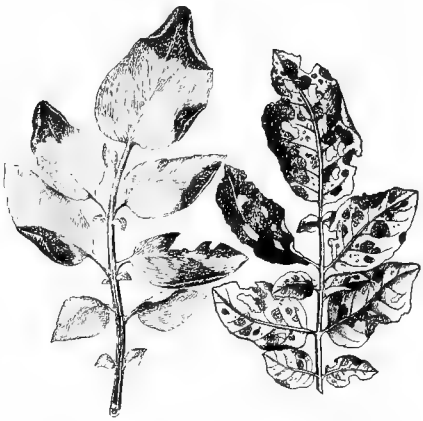

FIG. 161. — Prevent the two potato blights by spraying.

Ammoniacal copper carbonate solution can be made as follows: Make a paste of an ounce of copper carbonate and a little water. Dilute three-fifths of a pint of ammonia with a pint and a half of water. Stir in the paste until it is dissolved, then add enough water to make ten gallons. This

recipe can easily be divided by three. The mixture should always be used when pretty fresh.

The daily patrol of the garden should always be made with insects or diseases in mind. Look for leaves that have been eaten, or that are turning yellow, or that curl improperly. Look for red spots on the leaves, for little insects that dodge away as you approach, or for the eggs that will presently make those very insects. And when you find a foe to fight, attack him.

FIG. 162. — STRAWBERRY BLIGHT.
Diseased leaves should be promptly burned.

And always remember that one of the best helps against these enemies is healthy plants. The stronger they are, the better they will resist. Keep them vigorously growing, therefore, by cultivation, food, and water.

REVIEW QUESTIONS

1. What four classes are there of insect enemies that work above ground?
2. Describe the process of spraying. How do you expect to do it? With what mixtures?
3. Why should we not spray flowers?
4. Name the underground pests. Which have you seen? How do you intend fighting them?
5. How can special plant diseases be fought? Give examples.
6. Explain the best general method of prevention of disease.

CHAPTER XXXIX

Plant Friends

If we have plant enemies, it is pleasant to know that we have plant friends. These may not be of very many kinds, but they are many in number, and of course should be encouraged.

Bacteria I have already spoken of. They are useful in making plant food in the soil. To encourage them we need to keep the soil supplied with humus.

Worms are good plant friends, because they also are making the soil fit for plant life. Much of the loam in the garden has been, in past ages, prepared by being passed through the bodies of worms. A great man's study of their habits is contained in Darwin's "Vegetable Mold and Earthworms," where it is shown how they are constantly busy in making the loam deeper. They, like bacteria, prefer a soil that is full of humus, and they should be welcomed in any garden.

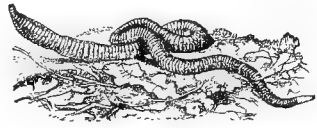

Fig. 163. — Worms are good friends of ours. Why?

Toads are notable foes of insects that harm plants. They forage mostly at night, and help to keep the insects in check. Toads do no harm whatever, in spite of what has in the past been said against them. Therefore they, too, should be given the freedom of the garden.

Many insects are busy in killing those other ones which

prey on plants. Most of them are, however, small and hard to see. But the ladybug, or ladybird, is one that we should learn to know at sight. She lives chiefly on the aphis, which is always injurious. Therefore the ladybug should never be killed by any gardener.

FIG. 164. — THE LADYBUG AND ITS LARVA.

Protect them both.

But the greatest friends of the gardener are the birds. If they should suddenly disappear from the earth, nothing could prevent the insects from ruining not only our gardens, but also our farm crops and our trees. Occasionally some mistaken person has persuaded people that certain birds were harmful, so that these birds have been slaughtered; but

FIG. 165. — In feeding their young, birds daily kill many plant enemies.

always the great increase in the numbers of insects has proved that the birds were needed. The English sparrow, to be sure,

is a pest, not because he does much harm, but because he drives away the birds that do good. The crow and the jay, mischief makers as they are, destructive, too, of the nests of other birds, do about as much good as harm. The shrike, or butcher-bird, has some good qualities. And of the hawks and owls, against whom so much has been said, only a few kinds, with a few individuals in the other kinds, are harmful. On the whole, the hawks and owls do good by killing the snakes and mice which are so destructive on the farm. Kill or chase away the sparrow hawk, the pigeon hawk, the duck-hawk (these three form the falcon family), the American goshawk, the partridge or Cooper's hawk, and the sharp-shinned or chicken hawk, with the great horned owl. But remember that on the whole all other hawks and owls, and all other birds, do much more good than harm.

FIG. 166. — Nesting boxes encourage birds to live near us.

To encourage them we must find what birds like. They all like nesting places; therefore plant shrubberies and trees, and provide nesting boxes. The winter birds need food. We must, besides, protect the birds; and there are three ways in which they are unnecessarily killed. The first is by the robbing of nests, often by boys who have not even the excuse that they are making a collection of eggs. The eggs should be let alone, except by collectors under the encouragement and direction of parents or teachers. Far better it is to study birds, to learn to know

them apart, and to photograph them, than to destroy their eggs to no purpose.

The second way in which birds are destroyed is by shooting. The pitiful slaughter of song birds is done partly by thoughtless boys, partly by foreigners ignorant of our bird laws. No one who appreciates the beauty of a bird, and its value to us all, will take part in such shooting.

FIG. 167.—Find some means to prevent your cat from killing birds.

The third source of bird destruction is the cat. Cats are useful animals, and they are charming pets, but they are by nature hunters, and will often do great destruction around a house. The careless keeping of several cats on a farm, where but one apiece is enough for the house and the barn, means death to many birds. A bell on a cat's neck will warn the birds of her coming.

Cats should be housed at night. They will then kill more mice and fewer birds. Where cats are kept, the nesting places should be protected against them, since cats love to eat nestlings. A band of sticky fly-paper, or of Tanglefoot, around a tree, will prevent a cat from climbing it.

Proper love for the garden, or indeed the natural desire to get what we can from the garden, leads us to this care of the birds, the most important of the friends of the plants. Such care will pay us. The sight of birds in the garden, the sound of their songs, and the knowledge that we are doing good not only to ourselves but to our neighbors by encouraging the birds, bring to us great satisfaction.

Review Questions

1. How do worms help the gardener? Tell what you know of them.
2. How do toads work for the gardener? Do they do any harm?
3. What is the service of the ladybug?
4. Why should gardeners protect birds? How may they be encouraged to come to the garden? Do you collect eggs? Why? Do you shoot song birds? Why?
5. How do you prevent your cat from killing birds?

CHAPTER XL

Garden Management

There comes at last a time in summer when the garden seems almost able to take care of itself. The gardener has time to walk carelessly about, look forward, and look back, and enjoy the present.

Looking back, it is easy enough to remember periods when the work of gardening took up all the spare time. I say *spare* time, because to most of us gardening is but extra work and pleasure; there are other duties that occupy most of the day. But early in spring, when preparing flats and mixing earth; and later, when spading the garden and planting; and perhaps later still, when transplanting: at these times especially the gardener had his hands full. In midsummer, however, everything is growing well, and though the fall is yet to bring its labor, that is still some weeks away. Yet even now there is some work and a little thinking to be done.

The first is the work of cultivation. After every rain, and again whenever the weeds start, the gardener should go out with cultivator or rake and renew the blanket of dust that is so valuable in keeping the ground moist. With this is the work of finding the weeds that in spite of the keenest eye will snuggle themselves away under the growing plants, not to be seen until the seed-stalks shoot to the light, bearing the blossoms, or perhaps the already formed seeds. It is for these, grasses, sorrels, or weeds of many kinds, that the gardener should always be on the watch. When found, they

FIG. 168. — Not a weed ! This is the way a vegetable garden should look in early summer.

should be pulled at once; the gardener should never be too busy to stop and pull one of these big weeds. For they are at the danger point: another few days, and the ripened seeds will be falling, to make trouble another year. So the annuals should be pulled, and the perennials should be dug out. If the seeds are already formed, the seed-stalk should be broken from the root, lest there should be enough strength left in the plant to ripen the seeds.

Again, there is the work of picking. Pleasant it is, yet it takes time. It should be regularly attended to. I have spoken of it in the first part of this book, yet I will repeat briefly here. The gardener should always know which flowers or vegetables are "coming on," and at the right time he should descend upon them with his basket. They should never be left too long. The flower that is not yet in full bloom, the vegetable that is still tender, are better for the parlor or the kitchen than those which are too old. With vegetables especially it is a strong temptation to leave them overlong, so that the basket shall be fuller. But they are never so pleasing to eat; the beans are a little stringy, the peas too firm. Pick them while still young, and you will know the real difference between market vegetables and home-grown.

There is also the war against enemies to be continually carried on. Part of it will be irregular, a call to battle by the sudden appearance of insect or disease in some new place. The call should be hearkened to at once. Go immediately to the work, and pick or spray until the danger has been met. The loss of a day may be very serious. Then for the vegetable gardener, at least for the one with a potato patch, there will be the regular work of spraying. The old spray will show for some time; but as soon as it weathers off, or whenever the new growth shows in good quantity, the spray

should be applied again. This is much better than spraying only two, or three, or four times a season.

Sometimes arises the question of watering. Our summers are often very dry, and often very hot. In spite of good

FIG. 169. — THE SPRAY-BARREL USED FOR WATERING.
Late in the day is the best time.

cultivation, the plants sometimes need water, and then the gardener desires to come to their help. Maybe, for lack of water to put on the plants, he must wait patiently for rain, meanwhile cultivating thoroughly. But if he has water, there is just one rule to follow: Give a good drenching, and then wait for several days, rather than water a little daily.

Soak the ground thoroughly, then cultivate, and let the plants tell you when they need help again. If there is not much water to give daily, then water only one part of the garden at a time, giving each part its turn once or twice a week.

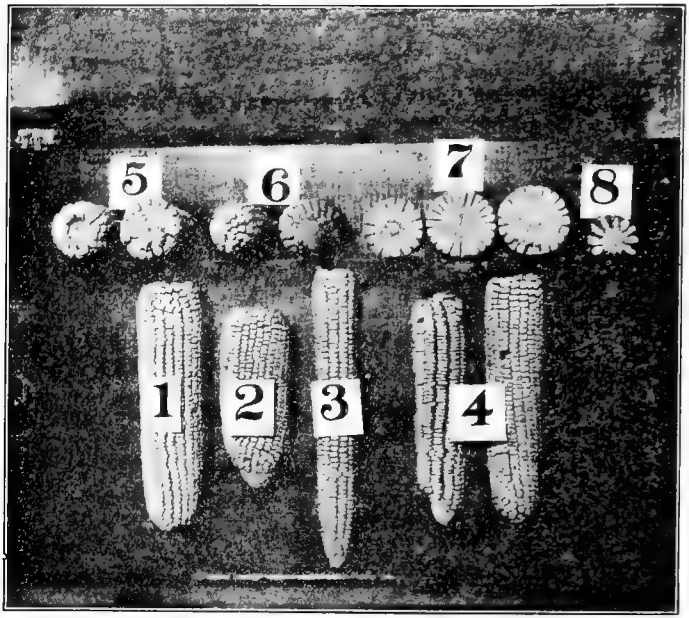

FIG. 170. — Types of corn for study.

This is a good time to study one's vegetables and flowers, practising the eye to choose good specimens. For instance, in Fig. 170, number 3 is an ear of field corn : could not one with a better tip be found? Is 1 or 2 a better ear of sweet corn? Which of the two at 4 is the better to save for seed? Study butts as at 5, tips as at 6, and depths of kernels as at

7 or 8. Work of this kind all tends toward the saving of good seed, or the choosing of fine groups for exhibit.

One can also try to breed a little seed from two plants of the same kind whose flowers show excellence. From an opening flower take the stamens, and on its pistils dust the pollen from the stamens of another. Then (as in Fig. 171) tie the first flower in a common paper bag (to keep out other pollen), label it, write in the notebook a memorandum of it, and leave it to make seed.

FIG. 171. — Seed breeding: a bagged flower.

From time to time you will see, especially if you are a vegetable gardener, that some of the plants have done their work, and should be pulled up. Be ready to do this promptly. As soon as the beans yield no longer, or the early corn is finished, pull up the plants, dig over the ground, and put in the next crop. As autumn approaches it will prove that you have no next crop to put in; that is, there is no time to mature vegetables or flowers.

But you can always put in a cover-crop to benefit the garden. In August put in crimson clover; in early September winter vetch; after the middle of September sow rye. Sow them broadcast, rake them and roll them in, and let them make what growth they will before winter. They will keep the ground from washing, and when dug under in the spring will provide what is known as green manure.

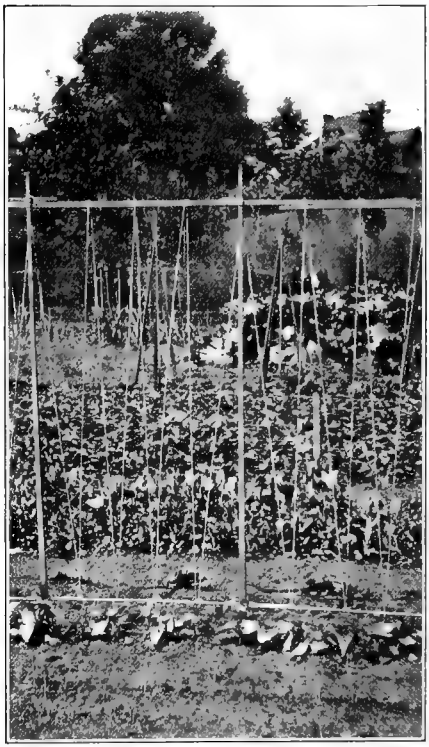

FIG. 172. — A good trellis for pole-beans.

At all times the garden should be neat. To begin with, put away all tools as soon as you have finished working. It is untidy to leave them about, it is bad for the tools, and it is even dangerous to leave a tool where the edge or points can be stepped on. In the next place, carry to the compost heap all such refuse as old leaves and stalks, with the plants that you pull up. Keep the compost heap itself neat, its shape regular, and with no rubbish lying around its

edges. Tread down everything that you bring there; thus it will not blow away, and will rot the sooner. When grass or weeds sprout in the pile, take the fork and turn them under. Finally, in the garden itself keep the plants in good order by supporting those that need it. For this you will need a supply of stakes, string, and wire. Set in all supports straight and firm, train the plants over them, and tie neatly. The string had best be the brown jute which can be bought in various thicknesses and cheaply; it lasts very well, and is soft. White string is too conspicuous. Raffia will do very well for tying; for those who are very particular it can be bought or dyed green. Much can be learned of the character of a gardener by noticing how he has made a string trellis for his beans, or has tied up his roses.

The daily work of all this is not great. The reward comes from the full baskets brought to the house, or in the restful moments when one straightens from work, and looks about on the thriving plants. But perhaps the best of it is to walk in the garden "in the cool of the day," looking reflectively about, planning, enjoying, perhaps helping a plant or pulling a weed, and seeing that the work of our hands is good.

Review Questions

1. Why not let the weeds grow as they wish?
2. How, without water, can we best bring the garden through a drought? How with water?
3. How do you pick vegetables? Flowers? Why not let vegetables grow to their greatest size?
4. What watch do you keep against plant enemies? How often do you spray your potatoes?
5. What is a cover-crop? What is its value?
6. What do you do to keep your garden tidy?

CHAPTER XLI

The Lawn

One who is fond of gardens will soon find an interest in the lawn, which should be one of the beauties of any place. To make one is not so difficult as at first appears. I shall not speak of the sodding of a lawn, except to say that the sod should be close, cut thin, and laid on good soil.

This good soil should also be prepared for the seeded lawn. On a few inches of poorly prepared soil one cannot make a lawn that will stay green through a drought. As with the garden, one should have a foot of good loam if possible. And the subsoil is also important, for the loam should be well drained; if the spot is very wet, it may be wise to lay tiles.

The loam should then be deep. It should also be rich, and as free of weeds, and especially of witch-grass and other perennial roots, as possible. In order to kill these out, the lawn-maker will sometimes grow a hoed crop, such as potatoes or corn, for the whole or a part of a season. Good cultivation should kill out all roots. But it will not kill weed seeds, which are to be found in all soils. I will speak of these later.

The season for planting the lawn is either early spring or late summer. Where the winters are mild, the late August or early September planting is likely to be very successful. But a "bad" winter, which is likely to come anywhere, may injure the new lawn. On the other hand, fall sowing is best where the summers are very droughty.

Dig the loam as deeply and carefully as for a garden.

FIG. 173. — A good lawn is one of the beauties of any place.

Make it fine to its full depth, and rake the surface carefully to the desired grade.

At the time of digging, the loam may be enriched. Use very well-rotted manure, in which the weed seeds are killed. Work it in deeply. Wood ashes, worked in at the same time, will benefit the lawn, while bone-meal is a very good fertilizer. There are some special "seeding down" fertilizers which will help, but be sure that they are "high-grade." If the soil is sour, which you can easily test by litmus, lime it freely. Wood ashes or basic slag bring lime. See for this subject pages 256 and 257.

The seed is the next consideration, and it is a very important one. Weak or impure seed is very largely sold; it is sure to result in a poor lawn. Go once more to the reliable seedsman of whom I have spoken so often, and tell him what you want. He will want to know whether the soil is shady or not, or wet or dry. Take the mixture that he gives you, calculating on three or four or five bushels to an acre according to his advice. The better the seed, the less you will use. One test of the seed is the weight per bushel: it should weigh at least 16 pounds, and more if possible. If your seed weighs 20 pounds per bushel, and you sow 60 pounds per acre, or about a third of a pound per square rod, then that is about right.

If you mix your own seed, get of each kind the best "recleaned." Mix each three pounds of Kentucky (not Canada) blue-grass with three of red-top, and a pound of white clover seed. If you do not want clover, mix the blue-grass and red-top in equal weights or measures to make a good average seed. But if the place is shady, use rough-stalked meadow grass instead of the red-top. In the South, use Bermuda grass instead of blue-grass. Mix thoroughly.

Now comes the sowing. Have the surface rather dry, so

that the seed will rake in well. Then sow the seed carefully, taking it from the bag or pan in the half-closed hand, and making the best kind of an attempt to sow it evenly. Study the fall of the seed, and correct your method, until you find that you have caught the knack. Go back and forth across the space, sowing in strips as wide as is convenient; and then when this is done, sow again at right angles. In this way the whole lawn should be evenly sown.

Rake in the seed now, going over the whole surface with a short-toothed rake. Then with as heavy a roller as you can easily manage, roll the whole surface as you sowed it, going in both directions.

While waiting for the grass to appear, be watchful. The surface should not be allowed to bake, for then the seedlings cannot come through. Therefore if the soil dries, and no showers come to soften it, hose very carefully at evening, being sure not to wash out the seed.

The hosing may have to be repeated even after the grass shows, if a drought threatens. Do not hose daily, for then the grass will not root deeply. But when you do hose, hose thoroughly. This is true of all hosing of the lawn. It is better to water but once every week or ten days, if only the soil is wet to the depth of the loam.

Parts of the lawn may not take the seed well, or later may die out. Then you will have to seed again. But if the grass is merely thin, it is best to scratch in more seed, using the rake vigorously, rather than to dig up the lawn and begin again.

When the young grass is growing well, at last comes the time to mow. For the first mowing the machine should be very sharp, for dull blades will often tear the delicate plants out of the ground. Mow regularly as often as the grass requires it, never letting it grow so tall that the clippings are noticeable on the lawn. For it is good for the grass if short

clippings lie on it. They work down among the roots, shade them, and finally decay, producing plant food. But if they are long, then they should be raked off.

In a drought, do not mow the lawn unless it is necessary. Leave the tops to shade the roots, until they grow so tall that the mower must be used.

The spring care of a lawn is simple, but should not be neglected. Rake it thoroughly, but do not tear the roots. Then as soon as heavy frosts have ceased, roll the lawn "both ways," so as to level it after the heaving of the frost. A good dressing is worth giving yearly, but manure is not advisable unless it is very well rotted. Better use sheep manure, or a good top-dressing. Sow the fertilizer freely on a thin or old lawn, but lightly on a good one, lest the work of mowing be unnecessarily increased.

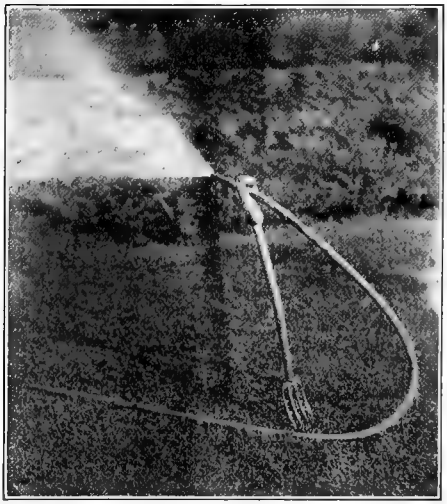

FIG. 174. — A simple method of watering the lawn.

Weeds in the lawn will often be a bother. At first they will seem very numerous, but most weeds need cause no worry. The first year's mowing will finish them. Dandelions, however, are a real trouble. They send their roots very deep,

will live through any drought, and if cut near the surface will simply make two crowns where one was before. They may be sprayed with sulphate of iron (rinse out the sprayer immediately after using!) but the remedy is troublesome and not very sure. The best thing to do is to dig the roots out by hand. I know of no patent tool that will do the work so well as a knife used to cut the tap-root several inches under ground. Then pull the plant out.

Cutting the edges of the lawn should be done a few times a year, yet by careful gardeners is sometimes done too often. The raw edges are not sightly, and if wrongly cut will frequently break down. Do not make them perpendicular, as is commonly done. Slant the spade or sod cutter away from you as you make the cut; then the grass-blades will start on the sloping surface, will make the edge look well, and save you much labor. All straight edges should be cut to a string tightly stretched between stakes. Curves should be cut with great care. Trimming edges may be done with hand shears, but more easily by long-handled shears.

A good lawn is worth working for, a pleasure at all times, except when it needs cutting. But the cutting of a lawn, like the cultivating of a garden, keeps you very well acquainted with your own property, and often warns you of some need which, if neglected, will later mean double labor.

Review Questions

1. Explain the value of a deep soil for a lawn. Tell how to prepare it for sowing.
2. When do you advise planting?
3. Why should you be careful in buying seed?
4. Explain how to sow a lawn.
5. Why should it be rolled after raking? Why in spring?
6. Tell how to water a lawn.
7. Tell how to get out dandelions.

General Review Questions

1. Describe what you consider a good position for a flower garden. A vegetable garden.
2. Why should one make a garden plan? Did yours work out well? Why?
3. What do you consider the best perennial flowers? Vegetables?
4. Explain the use and value of shrubs, roses, vines.
5. What fruits do you recommend growing?
6. What are tests of suitable tools? What ones do you wish to get? Why should you keep them clean?
7. Explain the difference between good and bad spading of a garden.
8. Tell how to plant in rows. In hills.
9. What is the value of thinning? What is your method of transplanting?
10. Tell of your most troublesome plant enemies. How did you fight them?
11. What bird or insect helpers have you found in your garden?
12. Explain the way to bring a garden through a dry spell.
13. Tell how to water a lawn. Why should it be rolled in spring?

PLANTING LIST

THIS list includes chiefly vegetables and flowers, mostly annuals and perennials of simple culture. Plants which are difficult to grow, or which, however easy of culture they may be, scarcely repay the work, are not included. For roses, bulbs, vines, and shrubs, see the chapters on those subjects.

When not otherwise stated, the soil for any plant is average garden loam.

The sowing of flower seed is usually broadcast. The depth of all sowing can be regulated by the size of the seed; cover it three or four times its own thickness.

The distances here given are for small gardens, in which the owners wish to grow as much as possible, and which are to be carefully cultivated by hand. The distances are therefore as close as plants should be allowed to stand; greater ones will usually give better results.

"Under glass" means indoors or in the frames.

All flowers should be fertilized with root-dressing (see the chapter on Plant Chemistry), except that when young and struggling, or when just transplanted, they may be fed once, lightly, with nitrate of soda or liquid manure.

Adam's Needle, see *Yucca.*

Ageratum, or Floss Flower: A moderately hardy annual, valued for its wealth of blue flowers, which are freely borne from July till late fall, if the faded blooms are regularly cut. It is a neat and bushy plant, coming in dwarf varieties (about 9 inches, used for edgings) and taller ones (seldom more than 2 feet, used in masses). Sow under glass in April, outdoors in May, and thin to 6 inches or a foot, according to variety. Frame-grown plants may be set out in

late May, after hardening off. Plants sown in August may be taken indoors in late September, and will bloom in the house.

Alyssum, commonly called Sweet Alyssum: A hardy annual, low and bushy, seldom growing more than a foot tall. It is valued for its masses of white flowers, borne freely all summer if not allowed to make seed. It is therefore one of the commonest edging plants. Sow where the plants are to stand, in late April or in May, and thin to 6 or 9 inches. Can be sown in August and taken into the house in late September. There is a perennial variety with grayish foliage and yellow flowers.

Anemone Japonica, or Japanese Anemone: A valuable free-flowering hardy perennial plant, most popular in its white variety, though there is one in red. Its height is eighteen inches or more, according to the richness of the soil. Flowers come in late summer, and last until hard frosts; they are good for cutting. It is not easily grown from seed (sow as soon as ripe, in boxes, and keep moist all winter in a place free from frost) and so is commonly grown from root divisions. When once established these plants are likely to spread too fast; cut back the roots each spring, and set the cuttings elsewhere, eighteen inches apart.

Aquilegia, see *Columbine*.

Antirrhinum, see *Snapdragon*.

Artichoke, Globe: An easily winter-killed but valuable perennial vegetable, not as yet very widely grown, though in Europe it is well known, and in our cities is considered a luxury. It can be easily grown from seed, but does not often bear the first year; if it is expected to yield in the first season, buy young plants. The edible part is the flower-head, which should be cut and cooked before it begins to open. The bases of its fleshy leaves are eaten.

Sow in deep and moist earth out of doors in May, or earlier in the frames. Transplant in May: rows three feet or more apart, plants two or three feet in the row. Or set out the bought plants at these distances. By fall the plant should be large and spreading, thistle-like. In October tie the leaves over the crown, and earth up to a foot or more, covering them with hay. But the plant

will often winter-kill north of New York. For that reason it is often best to buy the young plants, which yield in late summer. Where the plants are hardy, the bed may be enlarged by cutting away and planting the suckers which start from the old plants. Cut all flower-heads as soon as they form, whether or not they are to be eaten. Fertilize with top-dressing each spring. Globe artichokes do not yield for more than four years.

Artichoke, Jerusalem: A plant of the sunflower family, which yields both flowers and a vegetable. It is grown from tubers, which are hardy, and should be sown, usually whole, in April, in any soil which is not wet. The plants are tall, and should be set in the back of the flower bed, or in rows three feet or more apart. For best tubers, cut off the flowers. Do not dig the crop till the plants are killed by frost. Unfortunately the common artichoke is somewhat gnarly. Our seedsmen should import better varieties from Europe.

Asparagus: Our most valuable perennial vegetable, which grows to a great age, since fifteen years is the least that a bed should be cropped, and thirty to forty years is not uncommon. It is worth the space that it needs, and repays all the care that is given it. It has the great advantage of coming in earliest spring, when the shoots are daily cut for a month or more. But a young bed should not be cut until the third year, and should not be cut heavily until the fourth.

The plants may be bought. *Buy only yearling plants.* Set them in rows, at least three feet apart, and at least eighteen inches apart in the rows. Four feet by two is better. The plants should be set in trenches (set stakes *before* the plants are set), with the crowns at least six inches under the surface, and the roots carefully spread. Cover for two inches, and gradually fill in the trenches during the summer, while cultivating. Tie the tops to the stakes, to prevent injury and make cultivation easier.

If raised from seed, the best way is to start the plants in March or early April under glass. Sow three seeds to a three-inch pot, and when the plants are up take out the two weakest. Repot at least once, and set the plants in trenches, as described above, in late

May, without disturbing the roots. Raised in this way, a light cutting can be taken the third year.

If this is too troublesome, sow the seed outdoors in April, half an inch deep, in rows eighteen inches apart, thinly, and thin the plants to nine inches apart. In the second spring, transplant into the permanent places, and begin to cut two years later, when the plants are beginning their fourth year.

FIG. 175. — Set stakes for young asparagus before the plants are set.

In thinning, dig deep enough to get the crown of the plants. Merely pulling the shoots is not enough. Asparagus lives on big storage roots, which it forms at the very first, and which give strength to make more shoots.

Soil for asparagus should be as rich as possible, and should not be really wet. It should be at least a foot in depth. Much manure should be worked into the ground, and especially beneath the plants. At the same time asparagus will do well in any good soil. Fertilize

every spring, and after every cutting season, with top-dressing, freely. Nitrate of soda is helpful at these times. Manure in the fall, and dig the manure into the ground in early spring, if you can afford it. But my practice is to sow crimson clover among the plants before Aug. 15. This makes a thick mat before winter, protects the ground, and is dug into the ground in spring. This is as good as manure for the plants. In digging do not go too deep, or you will injure the roots.

Forty to fifty plants, in good condition and well fed, ought to produce a bunch a day.

Cut lightly the first year, say for not more than two weeks. After that cut for five or six weeks every spring. More than this is hard on the bed. Cut the shoots when about five inches tall, cutting two inches or more underground. Thrust the knife in pretty straight, and do not injure other shoots or the crown of the plant.

Cultivate regularly after every rain, and let no weeds grow. The worst weed in an asparagus bed is the young asparagus plant. Numbers spring up every year, so that at least once, after the cutting season, the bed should be carefully weeded with knife or trowel, getting out the roots. Watch carefully for more young plants *for another fortnight.*

On account of the rust, the variety is important. The Argenteuil is considered pretty safe, but the government is experimenting in raising a rust-proof kind. Write to the Department of Agriculture at Washington, or to the Experiment Station at Concord, Massachusetts. A perfectly rust-proof variety is not yet known.

Luckily the rust is not so troublesome as it was. There is little to do against it except to feed the plants well. Pests are beetles, whose slugs eat the young leaves. They can be poisoned, or if knocked off onto the ground will die.

Asters: There are two kinds, perennial and annual.

Perennial Aster (Starwort, Michaelmas Daisy): A native plant, growing wild in many places. The seed is seldom offered by seedsmen, and for the plants one must go to the field, to one's neighbors (who will often supply seed), or to the nurseryman. There

are several varieties, not well distinguished, and chiefly pink, lilac, or purple with yellow centers. They are rich and effective in the garden or the house. The flowers are not large, but are very numerous, and are borne in clusters on tall stems during September and early October. Divide the plants in spring, or sow the seed in April, thinning to a foot apart, and setting out two feet each way.

China Aster: A half-hardy annual, a little troublesome to grow, but yielding some of the very loveliest flowers. These come in all colors except yellow, in charming shapes, and very numerous. There are dozens of varieties, which group into distinct kinds, the best of which are the Chrysanthemum-flowered, Peony-flowered, Comet, Branching, Queen of the Market, and Ostrich-plume. They are equally fine in the garden or the house. Get good seed; it should be plump.

Sow under glass in March or April, outdoors in May, sowing every fortnight till June, if you want a long season. Thin to six inches, and set out a foot apart in late May. Put a collar on each plant, against the cutworm. Use little manure. Fertilize with root-dressing, and put some finely sifted coal ashes around each plant. Dress also with lime or wood ashes. Should the plants look sickly, mulch with tobacco stems. If you have sowed very early, flowers should begin to appear in July. The season lasts till frost, but the faded flowers should be picked.

Watch for black beetles, which eat the flowers. Pick them into kerosene morning and evening. Or hold under them a dish in which is water and a little benzene or gasoline. If aphis appears on the stalks, wash with weak soapsuds or kerosene emulsion.

Bachelor's Button, see *Corn-flower*.

Balm: An herb, used in scents and seasoning. A hardy perennial. It may be raised from seeds, cuttings, or root divisions. Set two feet by one.

Balsam: A tender annual of easy culture, yielding stalks with flowers growing at the bases of the leaves. The double and camellia-flowered varieties are the best. Buy good seed. Sow under glass in April, outdoors toward the end of May. Thin seedlings to

six inches; set out from one to two feet apart. The plants are bushy, especially if transplanted two or three times, and are two or three feet high. Early started plants should flower in July, and the season lasts till fall. The flowers will be better if the buds are cut until the plants are vigorously growing; the best stalks are got by allowing only a few stalks to grow and pinching out all the rest. Balsam does best on a rich, light soil, with plenty of moisture.

Basil is an annual herb, tender, its leaves used for seasoning, tasting of cloves. Sow seed under glass, or outdoors when frosts are past. Distances, one foot by six inches.

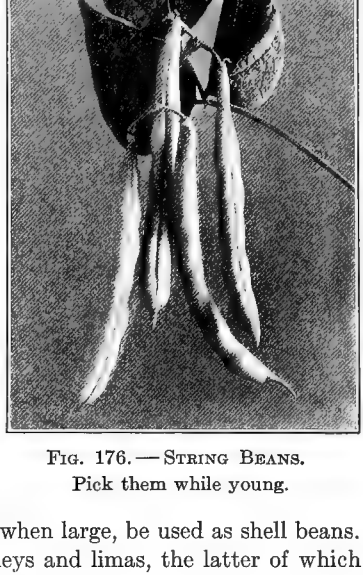

FIG. 176. — STRING BEANS. Pick them while young.

Beans: Among our most valuable vegetables, yielding dishes of a good many kinds. For the table, they fall into the classes of snap and shell beans; but nowadays, the pods of many of the best shell beans snap clean, and may be used for eating; while on the other hand all of the snap beans may, when large, be used as shell beans. Beans are also divided into kidneys and limas, the latter of which are broad, flat, and white. Limas are of slower growth. The only perennial bean is the Scarlet Runner, whose flowers are brightly colored. All beans are tender, and should be grown as annuals.

For the garden, beans classify as dwarf and tall. The dwarf are earlier and a little hardier; the tall beans are usually called pole beans, since they must be given something to grow on. If the gardener wishes to take much pains, beans may be raised under glass and set out, but this is seldom done.

Sow Dwarfs (or Bush beans) in rows a foot or more apart. Sow

in late May for security, though I always risk a sowing in April, and seldom lose it. Sow again every two or three weeks until August. Set the seed an inch or more in depth. Thin to four inches. Cultivate well, but *do not brush against the plants if they are wet*, especially if young. This care should be taken with all beans.

Sow pole beans in rows three or four feet apart, or set them in a row at the back of a small garden. They may be either in hills, two feet apart, with a pole set firmly in each hill; or they may be in a row, with a trellis running the length of it. Excellent trellises may be made of stakes and string; they give more air and sun to the plants. Thin the plants to six inches in the row, four plants to the hill.

FIG. 177. — "Turnip" beets.

Pick all beans when young, whether for snap beans or shell beans. They are much more delicate so. When ripe they may be dried and stored for the winter.

Cutworms are often troublesome with beans. Bait or dig for them. The only other serious trouble is a rust or spot on the pods. The best remedy is good seed and good feeding.

For variety, get a wax-podded as well as a green-podded string bean. The earliest lima is the Henderson's Bush, a small bean of which the tall variety is the Sieva. Large limas are Burpee's Bush (dwarf) and Challenger (tall). A reliable shell bean is the Horticultural, both tall and dwarf. Much better is the Flageolet,

just beginning to be imported from France. The Scarlet Runner is perhaps the best bean for a very small garden, since it yields flowers, snap beans, and shell beans. The English broad bean is not much grown in America, since it does poorly, and cannot compare with the lima, which the Englishman cannot grow.

Beans will grow in almost any garden soil. Give no fresh manure.

Beets: A very useful vegetable, yielding both greens and roots. The greens with very small beets make a delicious dish. The form of the root is either long or round, with the round more popular nowadays, since they grow quicker. Beets are very hardy. Sow thinly, since each seed gives several plants. Soak the seed overnight to hasten sprouting. Beets like a medium soil, moist but not wet. Fertilize with top-dressing. They can be much helped by nitrate of soda, applied beside the young plants.

Sow the seed in rows nine to eighteen inches apart, if the garden is to be cultivated by hand tools. If the seed is thinly sowed, the plants need not be thinned until they are large enough to be used as greens. Then thin to an inch or more apart, and repeat until the plants stand three or four inches apart. Keep on taking out every other plant as needed, until they all are gone. Beets may be planted under glass in March, outdoors in April, and every two or three weeks until August, or for greens even later. They are seldom transplanted. Roots dug in the fall should be stored in wet sand, to prevent shriveling.

Begonias: Ornamental plants, often of the brightest and most profuse flowers, or of handsome foliage. They are of little value out of doors, except in a shady border or along the north wall of a house, where they show brilliantly. They divide into three classes.

Tuberous-rooted begonias may be grown from seed or from tubers. The seed may be started in March or April, by simply pressing it into the soil. Keep moist and in darkness till sprouted. Transplant early into pots, and bring along rapidly under considerable heat. Do not set outdoors until June, in moist but well drained soil, and at least in partial shade. To grow the plants from seed is difficult, therefore it is best to buy tubers. Plant these with the

hollow side up, and in the fall lift them, dry, and store in a cool but dry place.

Fibrous-rooted begonias are best grown from stem cuttings, taken from the half ripened wood. Set in sand, keep moist, and they will root readily.

Rex begonias are grown for the beauty of their variegated leaves, which are much admired. They are best for the house. They start readily from leaf cuttings, set edge down, or made with a point at the joining of veins, which is set in the earth. Or lay the whole leaf flat, cut through the veins at several points, and keep the leaf pressed down by a weight until the roots start. The young plants should then be grown in pots.

Belvidere, see *Kochia.*

Black-eyed Susan, see *Cone-flower.*

Blanket Flower, see *Gaillardia.*

Bleeding-heart: An old-fashioned favorite, a hardy perennial whose drooping pink and white heart-shaped flowers, borne on bending stems, are coming again to popularity. Left undisturbed in the garden, in time it becomes a large plant; the roots should therefore be given about thirty inches space. It likes a light and rich soil and partial shade. Flowers come about the first of June. Buy the roots, and set them a couple of inches deep, in soil which has been deeply enriched with manure or compost.

Boltonia: A hardy perennial plant, which on account of its height (5–7 feet) should be used at the back of the border. Its flowers, white or pink or violet with yellow centers, are freely borne in autumn in large clusters, and are very handsome. The roots may be bought of nurserymen, and a single small clump increases rapidly. The roots may be divided in spring or fall, and set out afresh. Space 30 inches apart; cover two inches.

Borage is a pretty annual herb, its leaves used for seasoning in salads and cooking. It is tender; sow under glass, or after frosts are past. Succession every three weeks. Distance, one foot by six.

Broccoli: An English vegetable, grown much like the cauliflower, which it resembles. As it is no easier to grow than the cauliflower, and less delicate in taste, it is not popular in America.

Brussels Sprouts: Very hardy members of the cabbage family; the plants form tiny cabbages in the axils of the leaf-stalks. The plant requires a long season, and is best after frosts. Sow in late April, and for best success keep covered, like cabbage, with cheesecloth, after thinning the plants to stand three inches or more apart. Set them in the field in June, from fifteen inches to two feet apart according to whether they are dwarf or tall. The dwarf plants often bear loose sprouts, which the aphis enters and cannot be dislodged from; close sprouts are therefore better. Feed the plants well with top-dressing, or with nitrate of soda or manure water every fortnight. When the sprouts begin to form, break off the neighboring leaves, and nip out the crown. When very heavy frosts come in the north, the plants may be hung indoors in a cool cellar; but toward the south they may stand outdoors all winter.

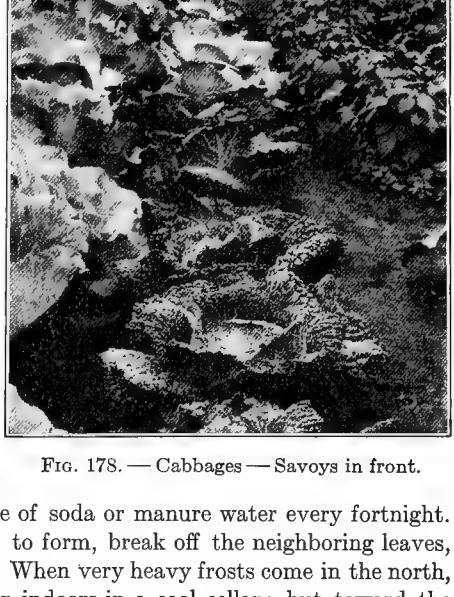

FIG. 178. — Cabbages — Savoys in front.

Cabbage: A widely grown vegetable, hardy, and offered by seedsmen in many varieties. There are large and late, or dwarf and early forms, red varieties, and very crinkled ones called Savoys. The common green cabbage is either heart shaped, round, or flattish.

Perhaps the most popular cabbages are the Jersey Wakefield, small and early, the Danish Ball-head, large and late, and the Flat Dutch, also large and late. The early varieties will soon split if left in the field, and do not keep well. But to keep even the late cabbages over winter is difficult, unless one has a very cool dry cellar, or can store them in the field out of reach of moisture or frost. Buy only good seed.

Sow under glass in late March or early April, out of doors in late April and early May. The safest way to raise cabbages, in regions where they are troubled by the maggot (which, hatching from eggs laid by a fly, eats the root) is to sow them in a light frame over which cheesecloth has been tacked. Never raise the frame except when cultivating or thinning, and replace it at once. Thin the plants to three inches apart, and keep them under the cloth until they are six inches tall. In the garden, dwarfs should be fifteen inches apart, larger kinds two feet.

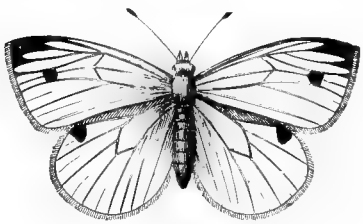

FIG. 179. — THE CABBAGE-WORM BUTTERFLY.
Catch him if you can.

Set the plants (each with a collar to protect from cutworms) in the field in late May or early June. A handful of old manure, or of compost, under each plant, will help greatly. Water well at first, and cultivate carefully at all times. Feed with top-dressing, and if possible with a little nitrate of soda or manure-water every two or three weeks.

The next danger to the plants is the cabbage worm, a fat green caterpillar almost the color of the leaves. It is hatched from eggs laid by the yellow butterfly; catch and destroy these. As soon as the worms are discovered, pick them off; or when the first of them are seen sift fresh hellebore on the plants. Or mix an ounce of Paris green with six pounds of flour and apply this lightly, when the dew is on. In such small doses it is not poisonous to man.

Cut early cabbages as soon as their heads are firm. Cut late

cabbages when heavy frosts come, and store in a dry cool place, after picking off all outer or sickly leaves.

If club-root gets into the patch, do not plant any of the cabbage family (Brussels sprouts, cauliflower, turnip) in the garden for three years. If leaf diseases attack the plants, burn the leaves.

Calendula (Pot Marigold or Scotch Marigold): A hardy annual flowering plant, whose blossoms (in all shades of yellow) come from summer till heavy frosts, if regularly picked. The plant grows about a foot tall, and is used to make masses of color in the border, as well as for picking. Sow under glass about the first of April, outdoors a month later, and thin or transplant to stand a foot apart. Seedlings under glass do best if potted.

California Poppy, or Eschscholtzia: A perennial, usually treated as a hardy annual, is a plant of thin bluish foliage, bearing many yellow flowers which, if regularly picked off, come all summer and even after light frosts. It is a very popular garden plant. Sow the seed very shallow, and as early as possible, and thin to about a foot apart. If transplanted, much earth should be taken with the root. Toward the south the plants will often live over winter. Seed sown as soon as ripe will give plants which, if lightly mulched, will live over winter and give very early flowers.

Calliopsis, see *Coreopsis*.

Campanula, see *Canterbury Bell*.

Candytuft: A very useful hardy flowering plant which comes in both annual and perennial forms, and in various colors, but which is most popular in its annual white variety, which is commonly used in masses and edgings. It is low and bushy, bearing many flower-heads which almost hide the foliage. There are also pink and red varieties. The flowers are attractive in the house, and should be regularly cut if the bloom is to continue. Sow out of doors in April, where the plants are to stand, and thin to about 9 inches. The soil should be rich and moist if possible, but the plant does well almost anywhere. For continual bloom, sow again in May and June.

Perennial candytuft is an evergreen plant, easily grown from seed. Sow in spring, thin or transplant in June to 9 inches apart,

and in September set 18 inches apart where the plants are to remain. They make fine masses of flowers early in the second year. Or sow in August, and winter under a little mulch, setting out the plants in earliest spring.

Canna: A very tender bedding plant which bears, in the old and taller varieties (7–10 feet) very handsome leaves, but in the new dwarf French varieties (4 feet) handsome red or yellow flowers as well. The plants are usually massed at the back of borders or the middle of beds. Their flowers are not useful for cutting, but should be picked as soon as they fade.

Cannas may be raised from seed, and for early effect should be started under glass. Soak the seed for a day in warm water, or else file the skin, taking care not to injure the germ. Keep moist and warm till the seeds sprout. Set out the plants from 15 inches (in beds) to 30 inches (if single) apart, and cultivate well, giving at first a little top-dressing. When the plants are killed by frost, dig the roots and store them like potatoes.

These roots may be used next spring for raising plants. If not too large, they may be planted whole; but they may be divided like potatoes, with two or three eyes to each piece. Start them in pots under glass, or set outdoors in late May. If started under glass, harden off, and set out in early June. The soil for cannas should be deep, the position sunny.

Canterbury Bell, or Bell-flower: A fine old-fashioned flower, still very popular with those who are willing to take the trouble to raise a plant which seldom blooms the first year, and which dies at the end of the second. Nevertheless, if started in March under glass, hardened off, and set out in late May, the Canterbury Bell will give good bloom the first year. Its colors are white or blue. The large flowers are borne on tall stalks, plentifully. One variety is named the Cup-and-saucer, because of its shape. There are perennials of the same family (Campanula) which bear smaller flowers, and which may be raised from seed, as described below, or set out from divided roots.

Sow early under glass for bloom the same year; pot, or thin to

4 or 6 inches; harden off, and set out in late May. Or sow outdoors in April, and transplant to 15 inches or more. Such plants should be mulched over winter, or covered with a cold-frame. If the seed bed is shady, and the plants are twice transplanted, in July to 6 inches or more, in September to their permanent places, 15 inches or more apart, they will be better able to stand the winter. Feed them in spring with bone-meal.

Good plants may be raised from freshly ripe seed, sown in August as soon as dry. Thin as above, mulch over winter, and set out in spring.

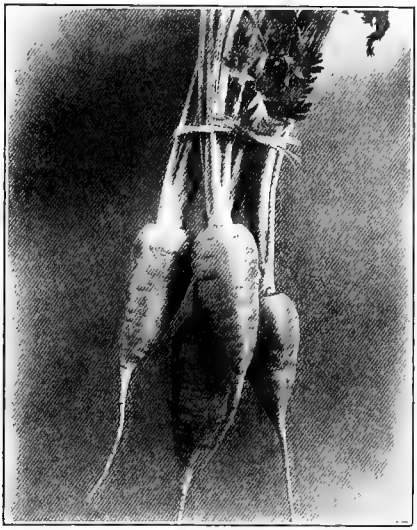

FIG. 180. — French forcing carrots are fine for the table.

Caraway: An herb, grown for its seeds, had best be grown as a half hardy biennial. Sow in spring or midsummer, and protect over winter. Distances, one foot by six inches.

Carnation, see *Pink*.

Carrot: A vegetable not yet enough grown in its finer varieties, which are small, early, and delicate. It is a hardy plant, whose roots must not be left in the ground in the North over winter, but should be stored in a cool place, and preferably in moist sand. It is of very easy culture, provided it is properly thinned; it has almost no diseases, and no pests except the parsley worm, which is easily detected and killed. The best kinds for the table are the early French forcing and the half-long.

Sow the seed, covering lightly, in any good soil early in spring.

Sow thinly, or the work of thinning will be considerable. Thin when the plants are well up, the small varieties to three inches, the larger to six. Cultivate carefully when young, for the foliage is very delicate and is easily buried. Sow again for succession at intervals of three weeks, until late June.

Castor Bean, or Castor-oil Plant (Ricinus): Grows from four to more than six feet tall, with large red or bronze leaves, and is used as a handsome background for beds, or for a screen in summer. It is tender, and must be started under glass in March or April, or planted outdoors in late May. It likes a rich and moist soil, a sunny situation, and good culture. Set the plants from eighteen inches to three feet apart, according to their variety.

Catnip: A hardy perennial herb; its leaves are used in seasoning, or to give to cats. Sow in May. Distances, eighteen inches by six.

Cauliflower: A plant of the cabbage family, very widely grown. In hot, dry situations it does not do well, but with a fair amount of moisture it will grow in most gardens. It comes in dwarf (early) and large (late) kinds, and its distances should accordingly be 15 or 24 inches. Get the very best seed. It is treated in many ways like cabbage: sow in a frame or seed bed in April and May; keep it under cheesecloth if possible, wherever the maggot is troublesome; thin to three inches apart; set out when six inches tall or more, with collars against cutworms; watch for the cabbage butterfly, and the first appearance of the worms; burn all diseased leaves.

When the plant is ready to flower it makes its head at the very center of the plant. From this time on examine carefully for worms. Either pick them by hand, or poison them, *before the appearance of the blossom*. When the flower begins to push aside the large leaves, so that it is exposed to the sun, tie the leaves over it with string or raffia, to keep it shaded. But occasionally open the leaves, to make sure that no worms have entered. Cut the head while it is still firm and close; if left too long, it will begin to spread out.

Celery: A vegetable delicacy, not easily raised by young gardeners, but always worth the raising. Earliest varieties are the self-

blanching. For winter storage the greener kinds are better. There is a pinkish variety. Get good seed. The soil should be deep, rich, and moist.

Sow under glass in March, or outdoors in a carefully prepared seed bed in April, and thin to an inch apart. Then transplant twice if possible, before the plants are set in the garden. This is to make them stockier, and to get better roots. The plants may be bought, but they are seldom so good. Set the plants in the garden during May and June, the early rows 18 inches, the late kinds four feet apart, the plants nine inches or more in the rows. Feed at each transplanting with nitrate of soda. Cultivate regularly, and keep the plants growing fast.

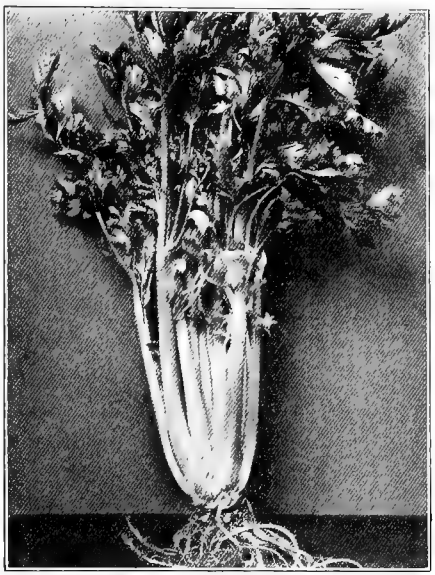

FIG. 181. — When you can grow celery like this, you really are a vegetable gardener.

Blanching the plants needs care. The early kinds are blanched by setting boards beside them to keep out the light; if blanched with earth they are likely to rot. Get hemlock boards at least a foot broad; they will last for years. Set them on edge on either side of the row, leaning inward, and held at the top by cleats or wires. At the bottom, stop all holes with earth. Such plants will usually be blanched before heavy frosts.

The greener kinds, which grow more slowly, are usually blanched

with earth. It is best to begin by tying the heads closely, to keep out the dirt. Then take earth from between the rows, and earth up the plants a few inches every week, until only the leaves are showing. When thus covered the stalks will gradually turn white. As heavy frosts come, the plants may be covered with leaves or

FIG. 182. — The earthing of celery should be done carefully.

straw, and by December they should be covered with boards or sashes, to keep out the wet. They can then be taken out as needed in the winter.

Or they may be stored in the cellar. In a pit, or in deep boxes, have a few inches of soil. The plants should not be too much blanched, or they will rot. When heavy frosts begin, take up each plant with a cube of earth, and pack them closely together under cover. If they should begin to wilt water them, but do not wet the leaves or stalks. See Fig. 20.

Centaurea, see *Corn-flower*.

Chard, or Swiss Chard: A hardy vegetable which has recently become popular, and rightly so. All summer it will yield greens, as well as firm white stalks, for the table. There are two or three kinds; the best has a dark green glossy leaf, with broad and white stalks. Sow thinly in earliest spring in rows a foot or more apart, after soaking the seed. Do not thin till the plants are nearly six inches tall, when the thinnings may be eaten. Thin again until the plants stand a foot apart. Feed with top-dressing, and with nitrate of soda every fortnight. Pick the leaves as needed, taking care not to exhaust the plants. There are no troublesome pests or diseases.

Chives, or Chive, or Cive: A hardy plant of the onion family, perennial, growing in clumps which spread rapidly and are easily divided. It is frequently sold in provision stores in spring. Planted in a damp rich soil it lives from year to year, and is often handsome with blue flowers which bear no seed. It is used for flavoring.

Chrysanthemums: These fall into two classes, annual and perennial. Both are hardy.

Annual Chrysanthemums: Mostly single flowers, the blooms mostly white and the yellows, with dark centers, hardy, and easily grown from seed. Among them is the Shasta Daisy. They are fine for cutting, or for massing in the garden, and they bloom from July till after frost. Their height ranges from one to three feet. Sow under glass in April, outdoors in May, and set out from one to two feet apart, according to the size of the variety. The soil need not be rich.

Perennial Chrysanthemums: These are among the finest flowers that grow, though chiefly the Japanese and the pompon kinds are suited for the garden. They may be raised from seed, like the annuals, but are most easily grown from root divisions. Japanese varieties are late, though recent varieties flower as early as August. For a flower requiring little care, and blooming at a time when almost all other flowers are gone, the pompon chrysanthemum cannot be too highly praised. It likes sun and a rich soil, but requires no

protection beyond the breaking down of its tops over the roots. The flowers are very double, small, not more than two inches across, but are borne profusely in clusters, in late October and in November, lasting after heavy frosts begin, and killed only by repeated freezing, or by being frozen when wet. Their finest colors are yellow and red. They multiply rapidly, should be set out in spring (not in fall, for their roots are very short), and should stand but a few inches apart for massed bloom. Most of them grow so tall that they should be staked.

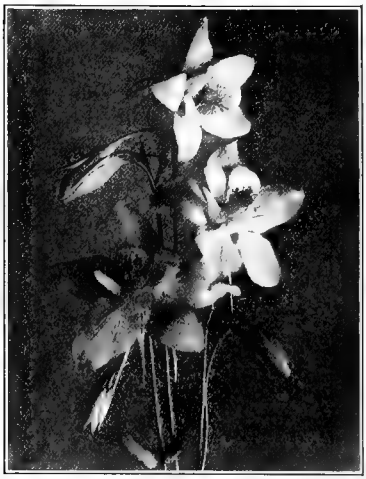

FIG. 183. — Columbine is airy and charming.

Perennial chrysanthemums may also be raised from cuttings of the stem.

If some of the flowers are nipped off when in bud, early, the remainder will grow much larger.

Cive, see *Chives*.

Clarkia: A hardy annual, growing from eighteen inches to two feet high, and bearing single or double rose or white flowers very freely through July and August. They are fine for bedding or cut flowers. Sow in any ordinary soil, but best in partial shade, outdoors in April and May. Thin the shorter kinds to about ten inches, the larger to eighteen.

Clematis, see *chapter on vines*.

Clove Pink, see *Pink*.

Cockscomb: A curious flower of the Celosia family, decorative, but not much grown in gardens. More beautiful is the Ostrich Feather, of the same family. Colors are reds and yellows. The plants are half-hardy annuals; they may be started under glass

in April, or sowed outdoors in mid-May. They will grow in any fairly moist soil. Thin or transplant the dwarfs to 12 inches, the taller kinds to two feet or more. When cut before they are ripe, and dried, the cockscombs may be kept for winter bouquets.

Columbine, or Aquilegia: A hardy perennial, often found growing wild, and easily grown in most garden soils. It is naturally red and yellow flowered, but there are modern varieties in white and blue; these like partial shade. The plants do not like wind. Once established, they grow freely from their own seed. This the gardener can sow as soon as ripe; or he may sow bought seed in early spring, covering slightly, where the plants are to stand. The young plants should be thinned to a foot or eighteen inches, or with care may be transplanted. The flowers come in late May or early June, and for their brightness and delicacy should be in every perennial garden.

Cone-flower, or Rudbeckia (see also *Golden Glow*), one variety of which is called Black-eyed Susan, is a hardy perennial which may be grown as an annual. The colors are yellow with prominent brown centers, and the flowers are showy. The plants may be grown from seeds sown in early spring in any soil, and thinned to about a foot apart. They may also be grown from root divisions. They are handsome in clumps in the garden in midsummer, and the taller kinds may be used as a background.

Coreopsis, or Calliopsis: A bright-colored hardy flower in both annual and perennial varieties, yellow with brown centers. The flowers are plentiful, showy, and easily grown; they last from midsummer until frost. Grown on long stems, they make good decorations for the house. Sow in March or April under glass, outdoors in late April and May. Thin or transplant to about a foot apart. The annual varieties should be tried by all beginners.

Corn, or Sweet Corn: This vegetable should be grown in every garden, for the dwarfs will find a place in even the smallest patch. It is a very tender plant, killed by the slightest frost; but some varieties ripen so early that it is worth growing anywhere. Kinds are usually white or yellow, and tall and short. Its worst enemy

is the cutworm, against which use baits before the plants are up. Sow tall kinds in hills, two feet by four, and thin to three or four plants. Short kinds may be grown in rows, about three feet apart, the plants nine to twelve inches apart in the rows. Cultivate often, but not deeply, and feed well, with root dressing. If the smut appears, swelling and blackening the kernels, the affected ears should be burned. The corn is not ready for the table until the silk is shriveled and dry; the ears should be well filled out to the tip. If only one variety is grown, and the ears are uniform, plump, and regular, seed may be saved for next year's planting. For this purpose, let the ears ripen on the stalk; dry, and store in a cool, dry garret out of reach of mice.

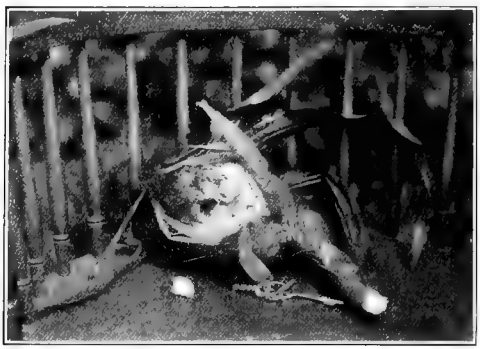

FIG. 184. — CORN SMUT.
Watch for it and destroy it.

Corn may be started in frames, and planted out in late May. In the open I always risk an April sowing, and plant every two weeks until the middle of June, or later.

Field corn is often very successfully grown by boys. For this purpose test seed as described in the chapter on the subject. Soils should be fertilized with special fertilizer, and if possible manured. Plant the hills four feet by two. Cultivate as often as it rains, and at least weekly through a drought, keeping account of the time spent. All accounts should be carefully kept of such a project as this. The corn, when ripe, should be kept in the ear, and good ears graded out for next year's use. Ten of the best, carefully chosen for regularity of rows, fullness of both tip and butt, and evenness and depth of kernels, should be chosen for exhibition purposes.

Pop corn is smaller than field corn and most varieties of sweet corn. Plant in hills, two feet each way, or in rows thirty inches apart, the plants nine inches apart in the rows. Cultivate like field corn, and when the crop is picked, save specimen ears for exhibition, and for next year's sowing.

Corn-flower (Centaurea), is also called Bachelor's Button, Kaiserblume, and Ragged Sailor, while a sweet-scented and larger, but less freely blooming, variety is called Sweet Sultan. It is a flower grown mostly as a hardy annual. Varieties are in several colors, but the old-fashioned and still most popular corn-flower is in blue, very freely flowering, and blooming from July till frost, if not allowed to go to seed. The flowers are not showy, but are very pleasing, and are good for cutting. Sow outdoors, broadcast, in April and early May, and thin or transplant to about a foot apart.

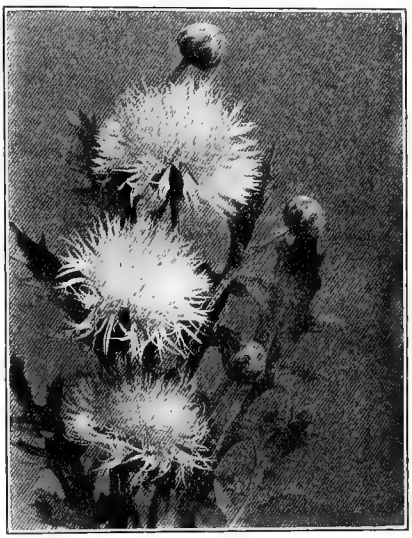

FIG. 185. — Sweet Sultan is a very double Corn-flower.

Perennials may be treated like the annuals, or sown in late summer and wintered over. The annuals seed themselves freely.

Cosmos: This flower has become much more popular since the development of the early blooming varieties, which in the north are safest to plant. It is a tall, free-blooming plant with attractive feathery foliage useful as a background. Its best colors are white and pink. The varieties are from three to six feet tall, the taller

being the later. These, in order not to be broken down, should be staked and tied early. They should also, in order to be sure of their flowers, be sown as early as possible under glass, and set out as soon as frosts are past. The soil should not be rich, lest the plants run mostly to foliage; it should be light also. If the plants grow straggly, they should be pinched back. As they are tender, they should be protected against early frosts. The smaller varieties need not be sowed so early, and since they are a little hardier than the others, they may be sowed outdoors about the first week in May, although it is still wisest to sow under glass. The blossoms of the newer varieties are often more than three inches across, and come from the end of July till frost.

Cress: The easiest grown salad plant; as its name Peppergrass shows, it is hot to the taste. It likes cool weather, and does best in spring and fall, going quickly to seed in summer. It should be sowed, broadcast or in rows, as soon as the cold-frames are set, sowing every ten days until June, and beginning again after the middle of August. Cress is never thinned, but is allowed to grow thickly and is cut a handful at a time, to use with lettuce. The very curled varieties are nearly as handsome as Parsley.

Cypress, Summer, see *Kochia*.

Cucumber: One of the squashes, a very tender plant which has several enemies, yet which on warm and rich ground is not hard to grow. There are a good many varieties, many of which are worth any one's growing. Like all the plants of its family, cucumber does not like transplanting, and therefore should, if started under glass, be sown in strawberry boxes, or on old sods, which may be set in the ground without disturbing the roots.

Sow under glass in March or April, three seeds to the box, and thin to one. Keep the plants growing well, but do not feed so much, nor keep so moist, that they grow spindly. Set out in the field late in May, in rich hills three feet or more apart, and protect from heavy winds until the plants are growing well. If they are too much inclined to run, pinch off the ends of the vines to make them blossom. As one planting of cucumber will not last all summer,

plant two more, three or four weeks apart, and be prepared to protect the latest against frost. An excellent way to grow cucumbers in the field is to protect the hill with a little frame, covered with glass or perhaps with cheesecloth; keep the frame on until the plants get too big for it. The hills should not contain more than three plants. Frames for this purpose, twenty inches square or more, are now sold by many dealers.

The worst disease of cucumber is mildew; against which, spray before it appears, using Bordeaux once a week, and taking pains to reach the under sides of the leaves. The various beetles that feed on the plant are a great nuisance. It is well to mix for them a poison with the spray. Or pick them by hand. Destroy squash-bugs' eggs. The aphis should be killed with soap, tobacco water, or kerosene emulsion. Burn all leaves or vines that are diseased.

Dahlias: Seldom grown from seed, and this is not advised. Plant them as directed in Chapter XXVIII, give deep and well-worked but not very rich soil, and protect from strong winds. The stalks should be tied to stakes. Dahlias are tender.

Daisy: The *English* (*Bellis perennis*): A low, neat, and very free-blooming hardy perennial plant, usually treated as an annual or a biennial. It is generally used as an edging, where its bright-colored flowers are very attractive. Sow early, under glass, and set out about six inches apart in May; sow outdoors in late April; or else sow late in August, and carry the plants over winter under a light mulch, or in a cold-frame, and set out in spring. These last plants will flower in May and June, the others later. Our hot and dry summers are hard on this plant, or it would be more popular on account of its wealth of bright flowers.

Daisy, Michaelmas, see *Perennial Aster*.

Daisy, South African, see *Dimorpotheca*.

Delphinium, see *Larkspur*.

Dicentra, see *Bleeding-heart*.

Digitalis, see *Foxglove*.

Dimorpotheca, South African Daisy: A plant new to this country,

a half-hardy annual, very welcome on account of its orange flowers, freely borne in summer. New varieties are rapidly being developed, different colored and larger, but the original plant is still (1914) the most dependable. The plant is small, about nine inches across, with flowers on stems of about the same height. It is useful for edgings, masses, or for cutting. Sow under glass in April, or outdoors in May, and thin or transplant to about nine inches apart. Keep the faded flowers picked.

Eggplant: A garden delicacy, a tender plant not usually successful except with those who are prepared to start it early under glass, and take much pains with it. The earlier, dwarf varieties are best for outdoor culture. Start the plants in March or early April in flats, and if possible transplant at the fourth leaf to pots, repotting as the plants grow. Do not water or feed too much, lest the plants grow soft. Set out in the field when frosts are past, in hills where compost or very well-rotted manure has been mixed with the soil, which should be early and warm. Distances for dwarfs, two feet apart, for standards three feet. It is well to protect in the field by small cold-frames at first. If plants are to be grown wholly in the garden, they should be sown in such frames, especially north of New York City, and thinned to three plants in a hill. Seedsmen offer plants, a dozen in a flat, cheaply in spring. It is well to spray eggplant with a poisoned Bordeaux, against both blight and insects, regularly every ten days. But the flowers should not be sprayed. Against the aphis use soap or kerosene emulsion.

Endive (pronounced *en'-div*): This plant should be carefully distinguished from the French delicacy *Endive* (pronounced *on'-deev*) which is grown from a chicory root, and which is best not attempted except by professionals. Common endive is a salad plant much like lettuce, though usually with a narrow and crinkled leaf. For best results, as it is bitter when green, it should be blanched. It is usually best, therefore, in the fall, when the blanching plants, being hardy, are slower to rot than in summer.

Sow the seed in rows six inches or more apart in August, in rich,

moist soil. Thin or transplant to at least six inches apart each way, and when the plants are about nine inches tall, tie them with string or raffia, to keep the light from the heart. The inner leaves presently turn white, when the plant should be cut and eaten. It is well, therefore, to blanch only a few at a time, tying a few more every week.

Eschscholtzia, see *California Poppy.*

Ferns: This class of plants is for the most part easily transplanted from its natural places to cool and moist and shady places in the garden. Take with each as much earth as possible, and give leaf-mold to grow in.

Flame-flower, see *Phlox.*

Floss-flower: see *Ageratum.*

Forget-me-not: A hardy perennial usually grown as an annual, which when once started seeds itself freely. The seedlings can easily be transplanted into any good soil, especially if it is somewhat moist. Or the parent plants may be covered against the winter. The plants are beautiful for edgings, or for blooming among clumps of other plants, and are attractive in the house. Sow the seed broadcast as soon as the ground is fit, and thin or transplant to about six inches apart.

Foxglove (Digitalis): A hardy biennial plant, very popular in old-fashioned gardens on account of its oddly shaped brightly colored flowers thickly borne on stems about two feet tall. The plants are useful in masses, as a background to smaller plants, or between shrubs. The colors are numerous. Soil should be rich and deep, with partial shade. Sow the seed in April when the ground is fit, transplant to six or nine inches apart, and in September set where they are to stand. Or sow in August the freshly ripe seed, nurse the young plants well, and set them in September as before. Plants should stand about two feet apart. They blossom in early summer. If the spikes are cut off as their blossoms fade, the remainder will grow the better. Foxgloves often seed themselves, and the young plants may be transplanted.

Gaillardia, or Blanket-flower: It comes chiefly in yellow shades, the centers dark brown. It is hardy, and is both annual and perennial. The showy flowers, borne on long stems, are useful in masses in the garden, or as cut flowers; they bloom from midsummer till frost. The annuals are easily grown. Sow under glass in April and set out in late May; or since the plants are hardy, sow outdoors in late April. Transplant to eighteen inches apart. Keep the faded flowers picked. Treat perennials in much the same way; protect in winter.

FIG. 186. — Gladioli are to be had in many colors.

Gilliflower, see *Stock*.

Gladiolus: This should not be grown from seed, but from corms which are cheap except in the finest varieties. The flowers of the gladiolus are handsome and even showy, though of the most delicate shades, in all colors. The soil should be light and quick. Set the corms at least four inches deep, at distances six inches or more each way. Stake the plants as they grow. If the flower spikes are cut when the lowest blossoms open, and are kept in fresh water with their stems daily cut, the buds will open one by one. Take up the corms as soon as their tops are killed by frost; take up also the little ones which have formed from them. Store in a cool dry place. The young corms will flower in the second year after resetting.

Godetia, or Satin Flower: So called from its satiny flowers in delicate shades of white and the reds; it is useful in borders, and for filling shady places. The flowers are excellent for the house; they bloom from early summer till frost. Varieties are dwarf and tall, single and double, and are best all treated as tender annuals. Sow under glass in April, outdoors after the middle of May, and thin to about a foot apart in light and rather poor soil. The plants spring again from self-sown seed, and transplant easily. Freshly ripe seed sown in August will give plants that may be carried through a favorable winter under a mulch of leaves, and will blossom especially early next year.

Golden Glow: One of the Rudbeckia family, a tall hardy perennial which is very useful as a background or screen, and makes fine handsome clumps of yellow flowers. While it can be raised from seed, it is quickest grown from root-divisions, which multiply very rapidly, so that in a few years a single root will, by division, make a fine show. The plants grow six or seven feet tall, and should be set three feet or more apart. The flowers bloom through August. If the stalks are then cut to the ground, a new crop of flowers, borne on short stems, will appear in late fall. The flowers of Golden Glow keep well in water.

Gumbo, see *Okra.*

Heartsease, see *Pansy.*

Helenium: A plant much like Golden Glow, but with smaller and more handsome yellow flowers, and following it in season, the plants sometimes lasting to the chrysanthemum time. It is best grown from root-divisions, which will rapidly increase. Set the clumps about three feet apart. The stems grow to about six feet in height, bearing the flowers in large heads.

Helianthus, see *Sunflower.*

Heliotrope: A plant of very pleasing scent, and good for bedding or cut flowers, is not easily grown from seed except in the greenhouse. It can be grown from cuttings, or the plants may be bought. As they spread rapidly when in deep, moist soil, they should be

given at least two feet of space; in lighter soil give less. They suffer from drought, and although perennial, will seldom live through a northern winter.

Herbs: Plants which are used for flavoring purposes, for medicine, and for perfumes. The old-fashioned herb-garden was a part of the garden set apart for growing a few plants, or a short row or two, of fifty or more different kinds. But they are much out of style. In this list see Balm, Basil, Borage, Caraway, Catnip, Horehound, Lavender, Marshmallow, Marjoram (Sweet), Mint, Sage, and Thyme.

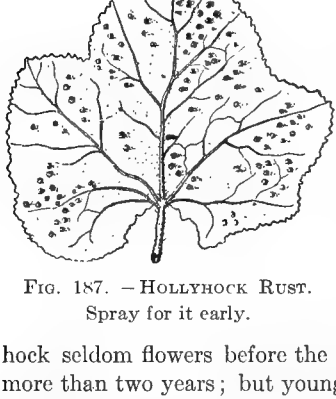

FIG. 187. — HOLLYHOCK RUST. Spray for it early.

Hollyhock: One of the finest garden flowers, a plant bearing many large blossoms, opening one after another on stalks often eight feet tall. It is therefore used as backgrounds, and for the filling of corners. The colors range from white through the reds to a deep purple that is almost black; the flowers are single and double. The hollyhock seldom flowers before the second year, and seldom bears for more than two years; but young plants spring up readily around the old, so that for years they will reproduce themselves. The finer varieties, however, must be sown every two years from fresh seed-packets, unless pains are taken to prevent crossing.

Seed may be sown in spring or early summer; or in August from fresh seed that is thoroughly ripe and dry. The young plants should be given nearly a foot of space; when they are transplanted to their final places they should have about two feet. This transplanting should be in late September, and the plants may be lightly mulched for the winter.

The worst enemy of the hollyhock is the rust, which when once started seriously injures the plant. In regions where it appears,

spray with Bordeaux or ammoniacal copper carbonate, beginning in May, every two or three weeks until the flowers appear, taking pains to wet the under sides of the leaves as well as the upper. The plants blossom through midsummer.

Horehound: A hardy perennial herb, its leaves used in cough medicines. Grow from seed, cuttings, or root divisions. Set two feet by one.

Ipomœa: This includes three different kinds of plants, morning-glory, moonflower, and cypress vine, all described in the chapter on Vines.

Iris: This comprises several kinds of plants, some of which are among the most beautiful and satisfactory perennials in the whole garden, being lovely in form, delicate in color, and very easy to grow. They cannot, however, be grown satisfactorily from seed; root divisions are needed. Among the several kinds the chief two are:

German Iris: A plant with a gnarled fleshy root, preferring a fairly dry situation. Its leaves are like stiff sword blades, the flower stems are stout and strong, bearing several buds which open one after another. The flowers are exceedingly delicate, and tear easily; they last, however, well in water. The varieties are according to the color and marking, which are almost as delicate and numerous as those of the gladiolus. The season lasts over a fortnight, with its middle about June 1st; and by a careful choice of varieties (consult the seedsman) it may be prolonged.

Japanese Iris: Follows German Iris in season. The root is more fibrous, and prefers a moist situation; the leaves are not so stiff, being more grass-like; the flower stems are not so sturdy, and more gracefully bear larger and more lovely blossoms, flatter in shape and deeper and purer in tone, seeming to hover like great butterflies. Colors, with many markings, range through white, lavender, and blue, to purple.

These Irises are very hardy, and the clumps increase in size, from year to year, so that every three or four years they should be divided. Give them about two feet of space.

Kale: A plant of the cabbage family, which bears loose leaves,

tall or dwarf, plain or crinkled, according to variety. It is usually either grown as a fall crop, or is carried through the winter to give early spring greens. Sow in early June in moist rich soil, the rows eighteen inches apart, the plants a foot or more apart in the row. Or sow in late August, and winter the plants under a light mulch, or even none at all.

Fig. 188. — Kohlrabi should be picked young.

Kochia, or Belvidere, or Summer Cypress: An annual plant bearing close green foliage, and shaped like a small cypress tree. The plants grow about two feet tall, and readily make a close thick hedge for a border or edging. In the fall the foliage turns to a beautiful red; but the plants are soon killed by frost. They seed themselves readily, however, and many little plants will come up the second year. Sow the seed in May, and thin or transplant to eighteen inches or more apart.

Kohlrabi: A plant of the cabbage family, which grows a turnip-shaped vegetable just above the ground. Varieties are green and red, variously shaped. They are readily grown in rows a foot apart or more, the plants six inches apart in the rows. Sow in early spring, with succession every fortnight until August, if wanted. *Kohlrabi must be picked when young;* otherwise they quickly become stringy. In rich moist ground they do well, and are worth growing.

Larkspur: A fine hardy flowering plant, bearing flowers in long

spikes. Colors are white and chiefly blue; avoid the purple. The soil for larkspurs should be cool and deep.

Annual larkspurs should be sown in early spring, under glass in March or April, outdoors about May 1st. They should be transplanted to stand from twelve to eighteen inches apart. They are very delicate and airy when in bloom.

Perennial larkspurs are larger and more robust, living sometimes ten years, and often sending up several stalks, five feet tall, from each plant. They may be sowed like the annuals, but probably will succeed best from freshly ripe seed sowed in August. Thin the plants to three inches, and in late September set out two feet apart or more. They will flower in June, and if the stalks are cut to the ground will bear a second crop in late fall. The pale blue and pure blue of perennial larkspurs can scarcely be surpassed, and the perennial garden can hardly do without them.

Larkspur roots can be divided if necessary. They should be set close to the surface, lest they rot. Or finely sifted coal ashes may be scattered over them.

Rust sometimes troubles larkspurs, and cannot be cured. Prevent it by spraying with Bordeaux in May and June, fortnightly until the time of flowering, and again after cutting back the stalks.

Lavender: True and Common Lavender are different shrubs, grown in the same way. Raise them in spring from cuttings of last year's wood, taken with a heel of still older wood. Set in moist, shady soil, until rooted, and in fall set out, four feet by two. Use the flower buds for perfume after the first year. During the first year, pinch off all flower spikes.

Leek: One of the onion family; it is grown with much care by those who like it. Sow seed in early spring, in rows six inches apart; thin to three inches in the rows. In May set in the garden, six by twelve inches, or less; feed the plants well. The soil should be moist. Leek is often blanched by being set in trenches or holes, and earthing up, after midsummer, to the depth of several inches.

Lettuce: One of the most widely grown of salad plants. It is hardy, and has many varieties, which classify as loose or close head-

ing, plain or crimped leaved, and green or russet. The Cos lettuce, or Romaine, is coarser leaved, growing in a tight upright head, and is grown chiefly in summer. The other lettuces may be grown, according to variety, in the cool weather of spring or fall, or in sum-

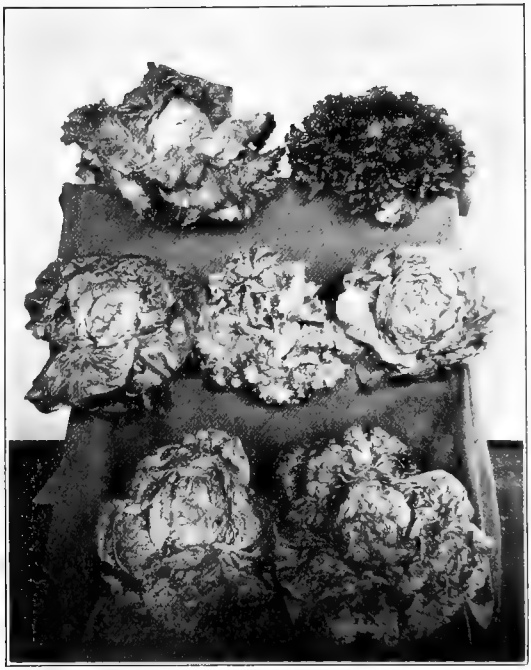

Fig. 189. — Various kinds of lettuce.

mer. Consult your seedsman as to which to buy for your locality. Plant the earlier varieties in successive intervals of ten days or two weeks until late May; then begin planting the summer kinds. In August begin again with the cold-weather varieties. Set frames over them when frosts begin, and carry them to December. To grow good head lettuce is not easy, for it requires rich soil and care-

ful handling; but any one can grow the loose heading lettuces fairly well.

Sow first under glass in March, in rows three inches apart, and sow again every ten days in the frames. Thin to an inch apart in the rows, and after the fourth leaf transplant to six inches apart. When the plants crowd take out and use every other plant, allowing the remainder to grow to full size. Sow outdoors, best in a carefully prepared seed bed, in April, and treat in much the same manner. Or sow in rows about nine inches apart, thin lightly at first, and as the plants grow, thin gradually to six inches, eating the thinnings. This is the lazy way to grow lettuce, and the remaining plants will never be so good as those which have never been crowded.

If Cos lettuce does not naturally head well, the plants may be tied with string or raffia until their hearts are well blanched.

Lettuce has no diseases, and no serious enemy except the cutworm. Against him, when transplanting, provide the plants with paper collars.

Lilies: They are not of easy culture, and their bulbs are often expensive. They like warm, rich, and well-drained soil; it is well to mulch them to protect the roots from drying out. The soils should be at least a foot deep, and the bulbs be covered at least three times their own thickness; the golden-banded lily should be planted ten inches or more deep. No fresh manure should be used in the soil, and it is well to set each bulb in a pocket of sand, to keep it from rotting. *Lilium candidum*, the Madonna lily, should be set in late summer; the others may be set in early October, or in spring. The tiger lily can be grown in any garden, coming up year after year. Consult the seedsman for other lilies for your neighborhood. Get none but plump and firm bulbs; all others are weak. Every three or four years reset lilies, dividing the clumps of bulbs, and setting the little ones out where they will have a chance to grow large. See also Chapter XXVIII.

Lily-of-the-valley: A fine, modest, perennial plant, always popular, which in a good soil and partial shade will multiply rapidly. Do not make the mistake of giving no sun at all. The pips must be

bought; set them in clumps of three or four about nine inches apart. They will increase rapidly. Each spring dress with some good root dressing, and do the same after the flowers are all picked. The plant has no pests or diseases. In October clumps may be lifted and set in bulb pans; after resting them for a month, bring them into the house, where they will give excellent flowers.

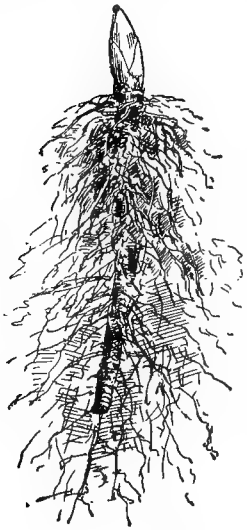

FIG. 190. — LILY-OF-THE-VALLEY PIP. Cover it an inch.

Lobelia: There are two classes of these plants. The first consists of the Erinus varieties, tender annuals, mostly bearing blue flowers, the plants not more than six inches tall, and excellent for edgings. The florist grows them readily from cuttings, to make sure of the color of his flowers, and their earliness (May); but the gardener will be satisfied to grow them from seed. Sow them under glass in April, outdoors in late May. Set out or thin to six inches apart. They like moist ground, and if well tended will flower till frost.

The best perennial Lobelia is the cardinal flower, a plant growing two feet or more in height, sending up spikes of flaming flowers, very handsome in midsummer. It grows wild in damp places, and can be transplanted; or it may be grown from seed sown in April, or when freshly ripe in late summer. Set the plants eighteen inches or more apart in moist deep soil. Other perennial Lobelias are not so satisfactory; one, which is often eight feet tall, is tender.

London Pride, see *Lychnis*.

Lupine: A free-flowering hardy plant, with annual and perennial varieties, dwarf and tall, and bearing their blue or white (sometimes rose or yellow) flowers closely set on long stalks. They are

easily grown in any good soil, except that they do not like lime and do like sun. They transplant poorly, and should be sowed where they are to stand. The dwarf varieties are fine for massing, and all of the flowers are attractive in the house. Sow the annual varieties as soon as the ground is fit, the perennials either then or from freshly ripe seed in late summer. The plants blossom in early summer. Perennial plants can also be grown from divisions of the roots. Distances should be according to the size of the variety, one foot or more apart.

Lychnis, or London Pride, sometimes called Alpine Lamp-flower, also Mullein Pink, Maltese Cross, and Ragged Robin, with still other names, according to the variety: A popular white, crimson, or scarlet flower of our grandmothers, found in annual, biennial, and perennial forms. It is easily grown in masses in a sunny place, and flowers mostly in early summer. Sow freely where the plants are to stand, in May, and thin to a foot apart. Some of the varieties are tender, but most of the perennials will live through our winters. Give some protection.

Marigold (for Pot Marigold see *Calendula*): A fine plant which every one should grow, valuable for yellow flowers easily grown, hardy, and lasting into frosts. There are two kinds of Marigold offered by seedsmen.

Dwarf or French Marigolds stand about a foot tall, bushy, and bearing flowers from early summer until after early frosts. They are easily grown by sowing under glass in March or April, or outdoors when the ground is fit. If they are started in flats, and potted, they will make bushier plants, and will flower earlier. They should be set about a foot apart, in masses, and are very showy.

Tall or African Marigolds are not so bushy, but look well in the border, or along the edges of the shrubbery. They may be treated in much the same way, and may be used for cutting, although to some their odor is objectionable. Set them about eighteen inches apart.

Marjoram, Sweet: An herb, its leaves used for seasoning. Grow

as a half hardy annual, sowing after May first. Set out twelve inches apart.

Marrow: see *Squash.*

Marshmallow: An herb, its roots used in candy making. It is hardy. Sow seed in spring, or get root divisions. Set two feet by one.

Mignonette: Almost a necessary plant in any garden, loved for the odor of its flower-spikes. These grow from twelve to eighteen inches tall, and the best varieties bear far finer spikes than the older sorts. The plant is hardy. Sow out of doors in early May, and again every three weeks. On rich soil mignonette is not so fragrant as on sandy soil; it prefers a little shade. Good culture, and cutting of the stalks before the seeds form, should provide for the house a plentiful supply of flowers. The plants should stand nine inches or more apart.

Mint, or Spearmint: It is seldom grown from seed, as it is so easily grown from a root begged from a neighbor. It is a hardy perennial, valued for the flavor of its leaves; once established in rich moist soil it spreads so fast as almost to become a nuisance. It is therefore well to inclose it in a frame of boards sunk at least a foot. On sandy soils it is not so troublesome. Sow the seed in early spring, and thin the plants to six inches apart. Or set root divisions at least a foot apart. The plant, except in poor soils, requires little feeding and no protection.

Moon-flower, see *Ipomœa.*

Morning-glory, see *Ipomœa.*

Mourning-bride, see *Scabiosa.*

Muskmelon: A vegetable delicacy, needing warm, rich soil, full sun, and moisture, for full success. The best soil is light and sandy, enriched with well-rotted manure. Change the location of the melon patch every three or four years. In windy places, or on cold soil, melons do poorly. The season ought to be lengthened by starting under glass; or at least, if sown in the garden, melons should have cheesecloth protection except south of New York.

Sow the seed as early as possible, in strawberry boxes, or inverted sods, and treat carefully, not allowing the plants to grow too soft. Set out (or sow in the garden) in hills four feet apart, which have been made rich with compost or very well-rotted manure. Three plants to the hill. If the plants grow too long without blossoming, pinch off the ends of the vines. Do not let the plants set too many fruit, but be satisfied with one, or at most two, to a branch. In

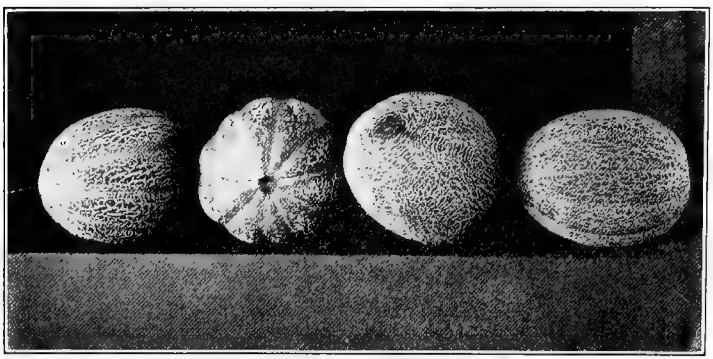

Fig. 191. — Muskmelons of different sorts.

buying seed, ask the seedsman what is best for your neighborhood and your soil. Varieties are many, but get good seed.

Pests and diseases are much the same as those affecting cucumber. See under Cucumber. Spray regularly with Bordeaux, to protect from rust.

Nasturtium: One of the brightest of all garden flowers, tender, easily grown, and yielding large pickings from summer until frost. The varieties are chiefly yellows and reds in many shades; best effects come from buying definite colors rather than the mixed seeds. There are two main kinds: dwarfs, used for massing, and climbing kinds, good for low screens or covering stone walls, to which they can be led by means of strings. For the best bloom the soil should not be very rich, for if it is, the plants will run to leaves.

The seed is large and tough, and should be soaked before planting. As the plants are very tender, if early bloom is wanted they should be started under glass in April, and will do best in pots. Outdoors sow in May where the plants are to stand; thin the dwarfs to about a foot, the climbers to but little more, unless they are to be allowed to spread on the ground; then, give more room. Keep the faded blossoms picked, or the plants will make seed and stop blooming.

Nicotiana, or Night-blooming Tobacco: A plant bearing handsome and fragrant flowers which open at sunset, or on dull days. It is tender or half hardy, and for early bloom should be sowed under glass in April. Sow outdoors in late May. The seed are small, and need to be sowed very shallow in moist soil, but the plants prefer a warm, deep soil in a sunny exposure. When the plants have finished blooming, cut the flower stalks just below the lowest blossom, and they will bloom again.

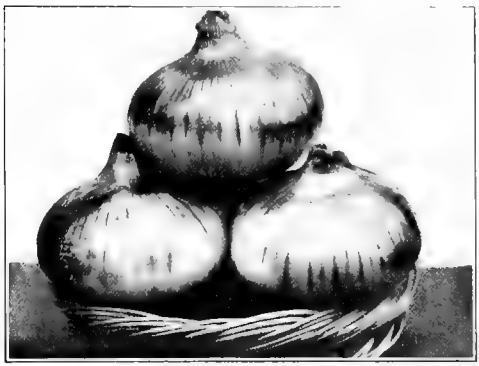

FIG. 192. — Onions need rich and moist soil.

Okra, or Gumbo: A vegetable popular in the south, and easily grown, especially in its dwarf varieties, in the north. It is grown for its seed-pods, which should be picked *when young*, before they become tough. When boiled, the pods are gummy; they can be served hot as a vegetable, or cold with salad, or used in soup. They are easily canned.

Sow the dwarfs in rows eighteen inches or more apart, the tall varieties two feet. Thin to six inches or more apart. The pods

begin to form immediately after the fall of the handsome flowers, and are ready to be cut in a couple of days. Test them for toughness by cutting across with a dull knife. The plant is very tender; do not sow before the end of May.

Onion: A very hardy vegetable, easily grown on rich moist land. Kinds are white, yellow, and red, flat and round; they are grown from seeds, or from sets, which are small onions started in a crowded seed bed the previous year, and which when set out begin to grow and produce an early crop. Set them three by six inches or more. For very finest onions, start the seed under glass in early April, keep growing fast, and protect with cheesecloth from the maggot; thin to three inches apart. Set them in deep moist ground in late May, and occasionally feed with nitrate of soda. Otherwise sow the seed out of doors in April, thin to nine by three inches, or more space if possible, and cultivate carefully.

The worst pest is the maggot; burn all weakly plants. Watch for cutworms.

Three crops may be had by growing in succession, first the sets, then the seed under glass, then the seed outdoors. Pick the plants as wanted; in fall break down the tops as frosts approach, and in a few days pull all the plants. Cut the tops and roots, and store in boxes in a cool dry place.

Ostrich-feather, see *Cockscomb*.

Oyster Plant, see *Salsify*.

Pæony, see *Peony*.

Pansy, or Heartsease: A fine hardy flower of great popularity, which every one would grow if it did not require a part of two seasons, and a little more care than usual. But it is worth the trouble. Varieties are many. Get the best seed.

Seed sowed in April will sometimes yield fall flowers, but this is uncertain. It is best to sow the seed some time during the summer, not later than August, and to thin the plants to four inches or more apart. Carry them over winter in a cold-frame or under a mulch, and set them out when the ground is fit. They will

bloom from May through the summer if the faded flowers are kept picked; but in dry weather the blossoms will be small. The soil

Fig. 193. — For best pansies, get good seed.

should be warm and deep. Set the plants six inches or more apart. Pansies can be cheaply bought in baskets in the spring.

Painted-tongue, see *Salpiglossis*.

Parsley: A vegetable used for garnishing meats, or to put in salads. It comes in several varieties, some very handsomely curled. It is very hardy. Sow in March or April under glass, or outdoors as soon as the ground is fit; the seeds sprout very slowly indeed, and may take twenty days and more. When the plants are well up, transplant them to eighteen inches apart if possible, and feed occasionally with nitrate. A few plants will do for a large family.

Parsnip: A very hardy vegetable yielding a large straight root which can be left over winter in the ground. Sow in rows twelve inches apart in early spring, and thin to six inches apart. Eighteen by nine inches is better. Give good culture all summer, and in the fall dig the plants as wanted. Those which are left in the ground over winter are said to be better for the freezing.

FIG. 194. — Curled parsley.

Peas: These are among our finest vegetables, and are easily grown in moist deep soil which is not too rich. Their kinds are dwarf (which require no support) and tall (which must be given something to climb on). Round-seeded peas are extremely hardy and early, but are not so delicate to the taste as the wrinkled-seeded. Their real use is to give a crop before the others are ready; they should be picked while very young. Sugar peas are picked when young, and eaten pods and all, like string beans. The pods are still stringy, but in future we may expect much from this vegetable, if the breeders will but develop it as they have developed other peas.

FIG. 195. — Large pods and full.

Peas suffer from lack of moisture, and their whole culture is based on this fact. The round-seeded peas should be sowed first; south of New York they may even be sowed in the fall (November) for spring sprouting. After them in spring the wrinkled sorts are sown, the dwarfs first, and taller kinds next, at intervals of about a week, until early June. Begin again in August to sow the dwarfs for a fall crop. In order that they may not suffer from drought, peas should be sown in trenches, six inches deep; cover them for a couple of inches. As the plants grow, fill in the trenches with each cultivation until the ground is level. With such deep roots the plants should not lack moisture. If they do, mildew will result, against which there is very little help. On rich soil the plants will mostly make leaves and stalks, and will give few peas.

FIG. 196. — Dwarf peas need no support.

If peas are sown

in double rows, about six inches apart, space is saved. The dwarfs thus help to support each other. But for the taller sorts some support must be provided in the space between the pairs of rows; use brush, or chicken wire held up on posts, or some kind of trellis made of sticks and string. A good kind may be made of laths, set crossing each other, with a couple of lines of string to hold them in place.

Peony: One of the finest garden perennials, beautiful in the shape and color of the large blossoms. The plant is free-bearing, growing larger from year to year, and very easy to grow. It cannot, however, with any satisfaction be grown from seed. Gardeners should buy roots, the bigger the more expensive, but also the more satisfactory. There are many varieties, single as well as double, and ranging from white through pink to the old-fashioned red. Some varieties are scented. A careful choice of varieties (consult your seedsman) will prolong the season by several days. The blossoms begin in late May.

FIG. 197. — Large fruits of pepper.

Culture of peonies is absolutely simple. The ground should be made as rich and as deep as possible; for each plant (standing thirty inches or more apart) it is well to prepare the ground as for a shrub or tree, to two feet of depth if possible, and with manure or compost mixed in with the earth. Plants may be set in August (use great care), in late September, or in earliest spring. Set the roots a few inches underground, and do not let them dry out. There will probably be no bloom until the second year, and the plants will not do their best until the third. But after that they will improve

yearly in the size of the plant and the number of blossoms. The flowers are most attractive in the house, often as delicate in color as the rose, but larger and lasting better.

The peony has practically no enemy but the rose-bug, which should be picked by hand.

Pepper: Tender vegetables, yielding two kinds of fruits, the small hot pepper, used in pickling, and the larger and mild or even sweet pepper, used in cooking and in salads. When ripe, the fruit is red; green peppers are the large, unripe fruits.

FIG. 198. — Start pepper plants early, under glass.

For best results sow in a frame in March or April, and transplant or thin to three inches apart. But they are best raised in pots, since they thus suffer less when put in the garden. Peppers may be sowed out of doors in late May, but north of New York they will not fruit well except with the best of soil and care. Soil should be warm and quick; cultivation should be frequent. Distances in the garden should be at least a foot; large varieties should have twice as much space. Pot-grown pepper plants are sold by many seedsmen in spring.

The pepper has about the same enemies as the potato; use Bordeaux and poison against the beetle and the flea-beetle. Diseases are few.

Peppergrass, see *Cress*.

Petunia: An old garden favorite which is not hard to grow, and

whose recent varieties, in white, the reds, and purple, are very beautiful, though very expensive. The plant grows about eighteen inches high, and is excellent, with its handsome flowers borne all through the summer, for beds and borders, and for the house. The petunia likes rich soil, but endures drought well; it is tender to frost. Varieties are single and double, plain and ruffled. The seed is very small, and should be simply pressed into the ground, and then kept moist. Sow under glass in early April, outdoors after the middle of May. Transplant to a foot or more apart.

Fig. 199. — Phlox comes in many varieties.

The new and expensive kinds are not yet fixed, and may not always bear double flowers. To get a good show of them, take out all that bear single flowers, setting them elsewhere; and take cuttings as soon as possible from the plants that bear double flowers.

Phlox. This comes in three important forms.

Drummond Phlox, sometimes called Flame Flower: A hardy, annual, low-growing plant, one of the best for edgings and low

masses on account of its close growth and many brilliant flowers. It has all colors but blue; the magenta shades alone are unpleasing, and are easily weeded out. It is best to buy the named varieties only. The plants vary from six inches or more to a foot, and seedsmen distinguish between various groups which are not very important.

Sow under glass in early April, outdoors a month later. A third sowing may be made in late May. The plants should stand nine to twelve inches apart, according to the variety. Bloom will commence in July, sometimes earlier if raised under glass, and will last into frosts.

FIG. 200. — Plant fine phloxes separately to prevent crossing.

Perennial Phlox (*Phlox decussata*) : A most dependable garden plant, yielding probably two crops of large flower heads, on stalks often two feet tall. The colors are white, pink, and the reds; they are clear and striking. The plants may be raised from seed, which is best sown when freshly ripe, in August. They may be grown from cuttings also. The commonest method is by root-division. Set the plants eighteen inches apart; they increase rapidly. The first crop of flowers comes in July. If the flower heads are then broken off, new heads will blossom in late fall. The plant should be watered when in flower. Fertilize or manure annually in spring. When the clumps get very large, divide and reset.

Creeping Phlox (*Phlox subulata*), sometimes called Moss Pink,

or Mountain Pink: A very low-growing, spreading plant, bearing white flowers in May. It is useful in the rock garden, and, like the other phloxes, likes moist soil.

Pie-plant, see *Rhubarb*.

Pinks: These are both annuals and perennials; for the biennial form, see *Sweet William*. All are very easy to grow from seed, though the very double forms, not commonly grown in gardens, are best raised from cuttings. Pinks vary considerably in size, and even in color; some of them are most deliciously scented. All of them like rich and well-drained soil, and are hardy.

FIG. 201. — China pinks.

The annual pinks (they are really hardy biennials treated as annuals) fall into the classes of China Pinks, Heddewigii (Japanese), Double Imperial, and Carnation (best grown in the Marguerite varieties). According to variety they are single or double, taller or shorter, but they are worth growing in any garden, and are pretty sure to yield well. Sow them among the earliest seedings, under glass in March or April, outdoors in late April. They should stand in the garden six inches or more apart. Once they have begun to flower, which some of them do very soon, do not allow them to go to seed. The Marguerite carnations will flower till heavy frosts, and under a light mulch will often live over winter, flowering the second year.

The perennial or Sweet May pinks come in several varieties,

more or less double. Best known is the Scotch or Grass pink, which forms low mats of foliage, and in early spring bears many fragrant flowers. It is excellent for edgings. These pinks are easily grown from seed (treat as above, but give a foot of space) or from root-divisions.

Poker Plant, or Red-hot Poker Plant: A brilliant late-flowering plant, half-hardy, which sends up showy spikes in fall. Its roots can be bought of seedsmen in spring; they should be planted in full sun, in masses in the border. The flowers appear in September and October. North of New York the plants are often winter-killed, even though mulched; the roots had best be stored like those of dahlias. They multiply rapidly, and can be divided before planting in spring.

Poppy: True poppies (see also *California Poppy*) come in three groups, all hardy.

Annual Poppies: These include the opium poppy, seldom grown, and a large variety of other poppies, of which the most beautiful are the Shirley poppies. They come in all colors, and are single and double, plain and crimped. Few flowers are more beautiful than some of those in this group. When once they have begun to bloom, often as early as June, they flower all summer if kept picked. They should be sowed thinly and covered lightly, best where they are to stand, as they transplant poorly. The soil should be light and rich. Sow from late April fortnightly till June, and thin to nine inches or more apart.

Iceland Poppies: These are perennials, but are grown as annuals. Whereas the Shirley poppies are often three inches across, and nearly two feet high, the flowers of the Iceland poppy are but half their size, and rise about a foot on very slender stems. The colors are chiefly bright yellow and orange shades, and the plants are exceedingly dainty and attractive. The soil should be the same as for the annuals, and they should be sown where they are to stand. Thin to six inches.

Oriental Poppies: These are perennial plants, very large, requiring nearly three feet of space in rich ground, which they love.

They can be raised from seed (they seed themselves freely) and from root-division; they should be transplanted with care when young, and even dividing the roots must be done with care not to let the plants dry out. Raising from seed is really the best method. Sow under glass in April, or outdoors in early May, and when the plants have their fourth leaf, set where they are to stay. They flower well (in June) after the first year, with great blossoms of strongest scarlet, marked with black at the heart. New shades have recently been introduced.

If cut for the house, all poppies should be taken as soon as they open, before the bees spoil them.

FIG. 202. — The Iceland poppy is attractive for its delicacy.

Portulaca: A low, tender plant which spreads rapidly, providing a cover for bare spaces, and beautifying it with yellow or red flowers. It thrives anywhere, but likes sandy soil and full sun, not minding a drought. It can be transplanted even in midsummer. It is a hot-weather plant; therefore sow outdoors, where it is to stand, in late May, and thin the plants to about a foot apart. The old varieties were single; modern ones are beautifully double, but much of their seed produces only single flowers, the plants of which must be weeded out.

Potato: An easily grown, tender vegetable, raised from its tubers and not from seed. For fear of scab it should not be grown on soil that has been recently manured; but it does well on grass land recently plowed. The soil should be rich, but not wet; earliest varieties may be planted in sandy soil. Consult your seedsman

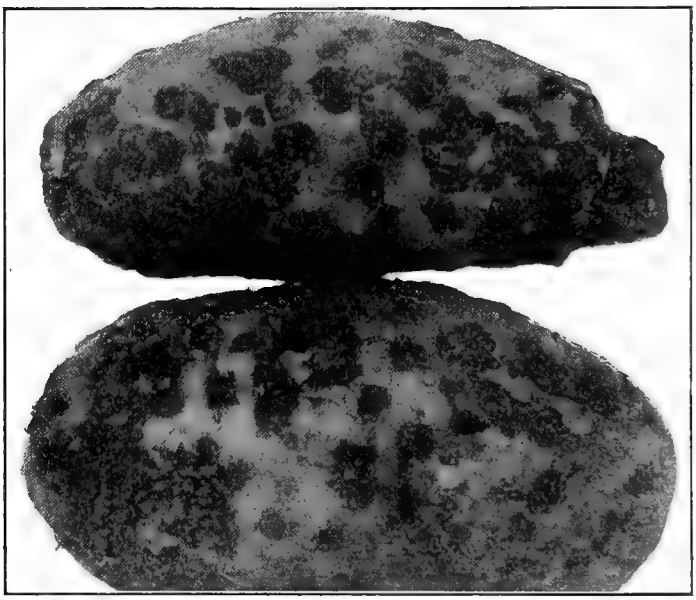

FIG. 203. — Never be satisfied with scabby potatoes.

as to the kinds best suited to your locality; but sow two kinds, early and late.

The worst disease of the roots is scab, against which roll the "seed," before it is planted, in flowers of sulphur, the most easily applied remedy. Or soak the potatoes, before they are cut, in formaldehyde (to be bought at any druggist's), a tumblerful (eight ounces) in fifteen gallons of water, for two hours.

Prepare the ground well, and scatter in the rows, below the seed-pieces, a good dressing of high-grade potato fertilizer, bought of a reliable dealer. Cut the large potatoes to at least two eyes; small ones, of the size of a hen's egg, are very satisfactory to sow whole. For earliness, all seed potatoes (uncut) may be started in a warm cellar, near the light, and set out as soon as the shoots are two inches long.

Early potatoes may be set eighteen inches apart each way, or twelve by eighteen inches if space is small, and if the plants are to be well fed and highly cultivated. Give later plants more space. Set all pieces four inches underground, lest the new tubers, as they form, rise above the ground, and so get sun-burned and spoiled. Deep setting will save hilling the potatoes (or earthing up), which in spite of old practice is not good for the crop, as it cuts many roots that feed near the surface, and dries out the soil. In *wet* soil, depth 3 inches.

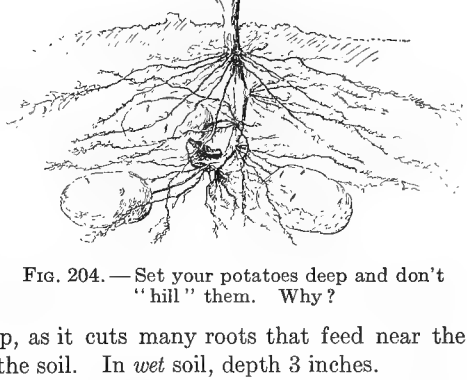

FIG. 204. — Set your potatoes deep and don't "hill" them. Why?

The worst enemies of the growing plants are the potato-bug and the flea-beetle; the serious diseases are the blights. To fight them all, spray the plants as soon as they are a few inches high, and after that every ten days, with Bordeaux mixed with arsenate of lead, or Paris green, which for small gardens can usually be bought ready mixed, needing only water to be ready for spraying. The arsenate sticks better. This frequent spraying is best in the long run, and there is no excuse except carelessness or laziness for applying either the spray or the poison alone.

Potatoes should be carefully cultivated after every rain, and weekly in a drought. Dig the early ones as they are needed;

leave the late ones in the ground (unless the season is very rainy, and rot is feared) as long as their tops are green.

Seed potatoes for next year should be saved out of any crop that does well. Note the plants which are largest, greenest, and strongest, and dig them separately. If they have good tubers, save these separately. But you should understand what is meant by "good" tubers, and to do this you should know what the variety is expected to produce. The shapes of the varieties vary considerably; the proper shape, and not mere size, is what should be looked for.

After digging potatoes, let them lie in the sun and light only long enough to dry them. Then box or barrel them quickly, and store them in a cool, dark, dry cellar.

Pumpkin: A running squash, and should be grown like one.

Pyrethrum, a Chrysanthemum, is a hardy perennial plant in many beautiful varieties, worth growing in any garden for the masses of tall flowers, which are attractive when cut. The colors range from white through red to purple, with a few yellows. The plants, when once established, flower in early summer; the single or double flowers are borne singly on stems usually three feet or more in height. Unfortunately, pyrethrums are likely to rot at the crown in wet weather; to prevent this they should be set in well-drained or sandy soil; their crowns may be protected by finely sifted coal ashes. Buy the roots, or sow seed in early spring, and thin to twelve inches or more apart. One variety, however, grows very low, and requires but six inches of space.

Radish: A hardy vegetable very widely grown, and especially welcome in spring as yielding the earliest of vegetables with the exception of asparagus. Buy always large, plump seed. Varieties are very many; the greatest difference is between the small red or white, cool weather, quick-growing sorts, and the large summer and winter kinds. Of these last I will speak separately.

The spring- and fall-grown radishes like coolness, and should be grown quickly on light, rich soil that does not need to be very deep. Sow as soon as the hot-frame begins to cool off, and follow weekly

in the cold-frame and the open ground until mid-June. The seed may be sown broadcast or in drills four inches or more apart; thin to two inches or more apart, and give the best culture. Pick the radishes as soon as they are large enough to eat; the longer they remain, the more peppery they get, and the more likely they are to grow pithy. Begin again after the middle of August to sow for fall use. The worst pest of the radish is the maggot, which quickly spoils them. Where it is found, therefore, grow radishes either in frames in cold weather, when the fly is not active, or else entirely under cheesecloth; otherwise give up the crop for a few years.

The large kinds are the summer radishes, which often average a pound in weight, and the winter radishes, often very much heavier. These last, though grown in summer and fall, may be stored for winter use. The large radishes are firm and crisp of flesh, and are sliced into salads, or even cooked. Sow them in June, in rows a foot or more apart according to variety, and thin to six inches or more apart. The large Japanese radishes need two feet of space.

Rhubarb, or Pie-plant: Grown for its thick, juicy leaf-stems, which are either pulled for some weeks in spring, when they are best, or else at intervals during the gardening season. The plants should not be exhausted by picking, or they will yield poorly afterwards. Flower stalks should be cut off the moment they appear, or they will weaken the plant. Rhubarb is not grown from seed, but is raised from root-divisions, which can be cheaply bought. Varieties are few. As the plants stand for years in the same spot, the soil should be well prepared for them. Dig each hill (four feet apart) as deep as two feet if possible, putting much manure in the bottom, and mixing with the soil well-rotted manure or compost. The soil should best not be cold, but rhubarb will grow anywhere, and poor soils can be made satisfactory with manure. Cover the crown a couple of inches, cultivate well, and do not pick until the second year. This first picking should be light, but the next-year stalks may be pulled for a month or more, always leaving about half of them to feed the plant. Pull them from the crown with a quick downward motion, and leave the broad leaves lying on the ground

to mulch the plant and to provide plant food. Four plants will be plenty for an ordinary family. Healthy, well-fed plants should fully cover four feet of ground and more. The plant has no pests nor diseases.

Very early rhubarb can be had in March or April by *forcing;*

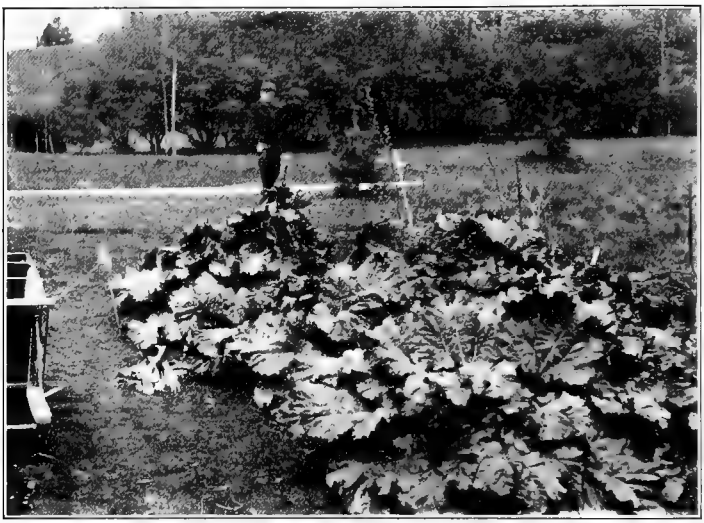

FIG. 205. — Rhubarb for the whole family.

that is, by packing heating manure around a plant (but not over the crown) and covering with straw, or with a tub or barrel.

Ricinus, see *Castor Bean*.

Rudbeckia, see *Corn-flower* and *Golden Glow*.

Roses, see the chapter on them.

Sage, see *Salvia*.

Sage: A name given also to an herb grown in three varieties, for flavoring or medicine. Grow from cuttings, layers, roots, or

seed; distances, a foot apart. As it is a half-hardy perennial, protect in winter.

Salpiglossis, or Painted Tongue: A half-hardy annual, provides in summer showy flowers, funnel-shaped with flaring mouth, in colors ranging from purple and brown and gold through yellow to white, always veined in darker tints. The blossoms are attractive in the garden, and last well in the house. Plants may be sown under glass in April (keep them growing fast) or outdoors in May. Distances in the garden a foot or more, the plants growing from one to two feet high. The soil should be light and rich, with partial shade.

FIG. 206. — Salpiglossis is always interesting.

Salsify, Oyster Plant, or Vegetable Oyster (so named from its flavor): A very hardy, long-season vegetable, which should be sowed very early, so as to give the roots, which do not grow as large as those of carrots or parsnips, as much time as possible for growing. Rows should be a foot or more apart, the plants four inches or more apart in the rows. The plants transplant poorly. Feed well with root

dressing, and cultivate cleanly. Use the roots in the fall as wanted, leave them in the ground over winter, or take them up and store them in damp sand in a cool cellar.

Salvia: This has a few varieties, some of them blue, but is best grown in its variety *Splendens*, or Scarlet Sage, which is usually treated as a half-hardy annual. It is one of the most brilliant flowers that we have, and is effective anywhere, but especially against a dark background. Get good seed of an early-blooming variety, and start it under glass if possible, or outdoors about May 15 in a sheltered position. Set in the garden, eighteen inches apart, in June. Soil should be light, and rich in humus, but not full of nitrogen, else the plants will bloom late, and this should not happen with sage. If well managed, the plants will send up their tall spikes in late July, and will continue blooming till frost.

Satin Flower, see *Godetia.*

Scabiosa, or Mourning Bride: This flower, which used to be offered only in dark colors, is now to be had in white and even in yellow. Its various kinds are usually treated as half-hardy annuals, sown under glass in April, outdoors after the middle of May. The soil should be light and rich, the position sunny. The plants grow from one to three feet tall, and should be spaced a foot or more apart, according to variety. The blossoms, borne on long stems, and attractive in masses in the border, or lasting well in the house, begin to bloom in July, and continue until frost. Scabiosa is a favorite in old-fashioned gardens, and is well liked to-day.

Sea-kale: A vegetable little known in America, but an English favorite which should be grown here by any who have room for a perennial vegetable, and who appreciate early spring vegetables. The plant has a taste of cabbage, hence its name. It lives for some years, and once the plants are well established, they can easily be multiplied by root-cuttings. Soak the seed before sowing it; sow in the cold-frame, or outdoors when frosts are past. It sprouts very slowly. Set out the young plants about two feet apart, and allow them to grow through the second year before cutting. Feed them well with manure and top-dressing.

In the third spring, before the plants start, cover them with boxes or pots, allowing no light to enter, or earth them up to a depth of five or six inches. When the shoots are six inches long under the box, or when they show through the earth, cut them for the table, taking with each a half inch of the crown. Continue this treatment for about three weeks; then cut out all buds but one, and when this is well started, level the earth over the plant, and allow it to grow for next year. The shoots are cooked and served like asparagus, with which sea-kale gives a very pleasant change.

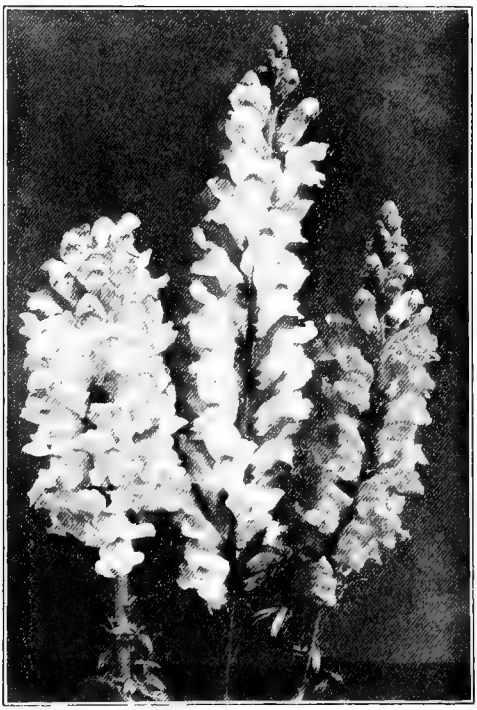

Fig. 207. — Recent varieties of snapdragon.

Every third fall root-cuttings should be taken, about eight inches long, and the size of a lead pencil. Keep them damp and unfrozen all winter, and in the spring, after rubbing from each cutting all buds but one, set them in a trench, the bud covered but lightly. Cover it as the shoot starts, until it is three inches deep. Or take cuttings in spring, and immediately plant them about three inches deep, the lower end slanting slightly downward.

Snapdragon, or Antirrhinum, a plant which with modern varieties has come into very great favor, is a half-hardy perennial treated usually as an annual, with thickly flowering spikes in white, reds, and yellows. It comes in dwarf (six inches), intermediate, and standard varieties (sometimes two feet tall), and is freely used for masses in the border, and for cut flowers. Sow the seed under glass for earliest bloom, and set out in May six inches to eighteen apart each way, according to variety. Or sow outdoors in May, and thin. The soil should be warm and rich, the exposure sunny.

If the seeds are sown in August, strong young plants may be raised before winter, which may either be taken indoors and flowered in the house, or protected by a mulch or frame for early flowering the next year. Such plants would flower in June; the ordinary treatment does not produce flowers until July or later.

Spearmint, see *Mint*.

Spinach: Prized for its early greens in spring, this is a hardy vegetable which comes in but a few varieties, all of them going quickly to seed in the hot, dry weather of summer. It is mostly grown in the garden in two ways.

Sow in spring as soon as the ground is fit, in rows about a foot apart, thinning at first to two inches apart in the rows, and when the plants are growing, thin well again, using the thinnings for food. The plants at the final thinning should stand six inches or more apart, and when they are of full size the whole plants should be taken. Spinach is mostly of two kinds: thick-leaved, hardiest to frost; and long-standing, slowest to go to seed in warm weather. A planting of each, a week apart in April or early May, should carry the garden into the season of other vegetables, such as peas, after whose coming spinach is seldom missed. If greens are wanted in the summer, it is best to depend on chard or New Zealand spinach.

Sow spinach again in late August, and give good care until the ground is frozen; then cover the plants with leaves, straw, or litter, and leave them till spring. They will give an extra-early crop under good conditions, but often winter-kill badly, and run early to seed.

Soil for spinach should be light and quick. Fertilize with nitrate, manure water, and top-dressing.

Spinach, New Zealand: New Zealand spinach is a summer substitute for spinach, a slow-growing hardy annual that is best planted outdoors in May, or else started under glass in April. Set out in hills, best two feet or more apart; the plant spreads very widely, often covering more than six feet. Keep it in bounds by picking the leaves and young tips when once the plants are growing vigor-

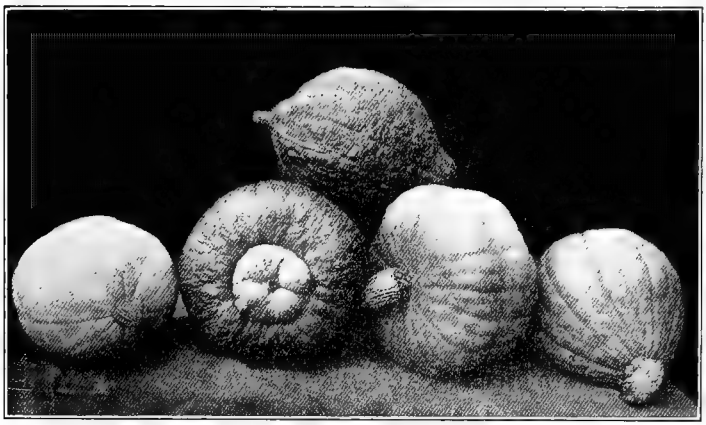

FIG. 208. — SQUASHES ARE OF SEVERAL KINDS.
These winter squash keep well.

ously; they are cooked like spinach. The plant has no enemies. It likes a heavier loam than spinach, and may be fed with top-dressing, and occasional small quantities, especially when small, of nitrate or manure water. It will seed itself.

Sprouts, see *Brussels Sprouts*.

Squash: A vegetable of several kinds, some, the bush squashes, yielding early, others, the running varieties, requiring all the season. It is very tender, and should when possible be started under glass, in such fashion (using strawberry boxes, etc.) that its roots will not

be disturbed when the plant is set in the field. Or start in little frames out of doors. Some of its varieties, with the pumpkin, are rather coarse; but the finer are delicate. Not yet properly known is the Vegetable Marrow, a squash cultivated widely in England and Italy, and now offered by our own seedsmen. Set the plants in hills, three to the hill; the soil should be made rich with compost or with old manure. Do not feed with nitrogen except in small doses when young; the plants will otherwise run to vine.

Bush squashes should be given three feet or more of space; running kinds should have at least six. To sow squashes with corn, as the farmer sows his pumpkins, is fair neither to the squashes nor the corn.

FIG. 209. — MARROWS, SMALL AND BIG, WITH BLOSSOMS.
Fry the blossoms in batter.

Marrows are both bush and running, and come in several varieties. They may be used to boil, like squash, or when three-quarters grown may be sliced and fried, like eggplant. One of the best ways in which to use them, however, is to take them when two or three inches long. As fast as the young fruits are picked, the plants set more. These young fruits are very delicate. Squash, having a coarser rind, cannot be so used. Squash blossoms are excellent when fried in batter; pick only the staminate blossoms, on the long stems; the others are needed for fruiting. With the best kinds of winter squashes allow only one fruit to each branch.

The worst pest of squash is the squash bug. Watch for the shiny brown eggs laid on the under side of the leaves, tear them off, and destroy them. If the eggs escape you, and the bugs hatch, kill them relentlessly, before they grow larger. If the cucumber beetle attacks the young plants, poison them with pyrethrum or hellebore, or pick them by hand. Mildew is often troublesome; against it spray as for cucumber.

Starwort, see *Perennial Aster.*

Stock, or Gilliflower: A fine, free-flowering plant, excellent for the garden or the house. It is cultivated in two ways.

Summer flowering stocks, often called Ten-Weeks stocks, are easily raised, to flower from midsummer until after the first frosts. The plants are not very large, from a foot to eighteen inches, but may be massed in the border, where their colors (yellows and reds, but best in white and pink) are very attractive. Like the other stocks, they bear their flowers (usually very double) closely crowded on stalks. Sow them under glass in March or April, to set outdoors in late May; or sow outdoors after the middle of May. Successive sowings, a fortnight apart, will pay. The plants should stand about a foot apart. They like deep and rich soil, and should never be allowed to dry out, or they lose their leaves.

Autumnal stocks are half-hardy biennials, and if started early, as directed above, will give brilliant bloom in the fall. Or they may be started in August, to be taken into the house at the approach of frost, or to be wintered, south of New York, through mild winters under a mulch, or farther north in a frame. They will flower well the second year.

Sunflower, or Helianthus: It may be grown in both annual and perennial varieties. Annuals are mostly tender. They vary from the well-known large single flowers to smaller ones borne singly or in clusters. The blossoms vary much in shape, some of them being very attractive. Heights vary; the flowers are all yellow, as are the perennials. Plant the annuals in late May. The perennials are hardy, and are more varied and interesting than the annuals; they may be raised from seed (sow in late April or early May) or from root-divisions. Annuals do well in moist ground, but the perennials prefer dry soil, and must be reset every few years, or they will die out. Sunflowers are very effective and useful when planted as screens or among shrubs. Space them from eighteen inches to four feet apart, according to the variety.

Sweet Pea: One of the finest garden flowers, its one drawback being that except on the dwarf varieties, not as yet very popular,

it does not look well when growing. Its foliage is thin, and in late summer sometimes becomes mildewed; further, the tall plants must have some support, and this support is seldom handsome. But the flowers are most beautiful for picking, and are fragrant. They may well occupy a row in the vegetable garden, where they get the treatment which exactly suits them.

Grow the dwarfs in clumps, eighteen inches apart.

The tall varieties bear flowers in endless choice of shades, whether pure or variegated, and in several shapes. For largest blossoms expensive seed should be bought; it is well also to buy the named rather than the mixed varieties, and to grow them separately.

Seed of sweet peas are very hardy, and toward the south they may be planted in November for spring flowering. But this is an uncertain practice; generally it is best to sow them in spring as soon as the ground is fit. For their reception make a trench a foot deep, pack in the bottom old manure, and on it put strong loam, mixed with bone-meal. Six inches below the surface of the garden sow the seed, and cover an inch or two. As the plants grow, gradually fill in the trench till it is level. This is the best treatment, designed to give a long season of bloom and to prevent mildew. The nearer the gardener can come to it, the better will be his results. But no nitrogen should be used, or the plants will run to vine. It is best to have two trenches, side by side, six inches apart, and to run the support between. For this, brush or chicken wire are commonly used.

Pick the flowers as they open out. Never let them fade or go to seed.

Sweet Sultan, see *Corn-flower*.

Sweet William: One of the Pink family, a biennial flower bearing large trusses of white or pink flowers, very handsome when well cared for, and seeding itself so well that when once it is established in a bed there is no failure of plants. It grows eighteen inches or more tall, and is fine for massing in the garden, or for cutting. The flowers are sweet-scented, and are single or double, handsomely fringed. Sow in the spring when the ground is fit, thin to six or

eight inches, and cultivate well. Transplant in September to the final positions, eighteen inches or more apart, in strong soil. Or sow in seed bed freshly ripe seed, when once well dried, in midsummer, and set out in September. The plants will bloom handsomely the second year.

Thyme: In various varieties, this is used in seasoning. A half-hardy perennial, grown from seeds or root-divisions or from layers. Set a foot apart.

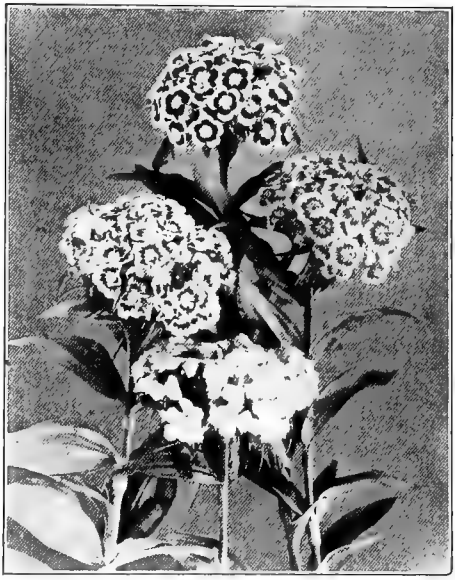

FIG. 210. — Sweet William makes fine clumps.

Tomato: A vegetable much improved in recent years, and worth growing in every vegetable garden, where a very few plants will yield many fruits. The plants are tender, and, as when once bearing they will continue until frost, it is wise to start them very early. There are dwarf and standard kinds, the fruits ranging from small to very large; there are some whose plum-like fruits grow in bunches; and besides the red there are pink and yellow kinds. Tomato has few enemies except an occasional rot that is hard to control, but which is best prevented by keeping the fruit off the ground, either by training, or by a mulch of straw.

Tomato plants are sold in great quantities cheaply in spring, but from a five-cent seed-packet one can raise many plants at home.

Sow them under glass in March or April, and (south of New York) out of doors after frosts are past. Two sowings are scarcely necessary. Thin the young plants to stand four inches or more apart, and when hardened off, set them in the garden, in deep, rich, moist soil. Protect them with collars, from cutworms. The distances should be according to the style of training. If the plants are to be allowed to lie on the ground, they should be set three feet by eighteen inches or more; if they are to be trained, they may stand as near as a foot apart in the rows, the rows eighteen inches or more apart. All depends upon the kind of trellis, however. Supports for tomatoes are often made of barrel hoops held up by stakes. But the simplest means of training tomatoes is by tying them to stout stakes, set to the north of the plants. Tie the plants as they grow, loosely, by means of raffia or soft cord.

The pruning of tomatoes is worth while, because it brings an earlier crop. Half of those which are set should be pruned, in order to secure early fruits. Allow only one, two, or three stems to grow on each plant, and after these are started, cut off from all of them, weekly, all side shoots. The fruits that start on these plants will ripen fast. Use a knife in taking off the shoots, so as not to soil the fingers.

Protection of the plants from early frosts will lengthen the season. Trained plants may be cut from their stakes and laid on the ground when frosts approach, so as to be conveniently covered at night.

Tritoma, see *Poker Plant.*

Turnip: A vegetable of the cabbage family, grown for its root, which is white or yellow. The plant is very hardy, and may be sowed in early spring, in rows about a foot apart (more space is better) and thinned to about six inches in the rows. It is a short-season and cool-weather crop, and may be sown again in August for a fall crop; in summer the roots are woody. Feed well with top-dressing. Where the maggot is troublesome, it is scarcely worth while to sow turnips except under cheesecloth; and if the club-foot gets into the ground, the crop should not be sown for two or three years. Turnips are seldom transplanted.

Udo: A Japanese perennial vegetable, little known. It is grown in two forms, of which only Kan Udo should be grown by the average gardener. It is grown from seed, which is not carried by all seedsmen. One desiring to get it should write to the Department of Agriculture at Washington, D.C.

Sow in a seed bed, in early spring, and thin to six inches apart. Transplant when six inches tall into the garden, in a row close to the asparagus and rhubarb (see page 197). Distances should be two feet by one. The soil should be rich and deep. Feed well with top-dressing, and cultivate carefully all summer. In early September cut the plants to the ground, and cover with boxes or pots, or earth with stone-free soil to a height of a foot or more. Cut the shoots when they show through the earth, or in the boxes when eight inches or more long. Do not injure the smaller shoots, but continue cutting as long as shoots come. Then level the earth around the plants, and mulch for the winter with straw or leaves. Manure in spring, or give top-dressing.

Vegetable Marrow, see *Squash.*

Vegetable Oyster, see *Salsify.*

Verbena: A low creeping plant, grown as a hardy annual, and used for covering bare spaces in full sun. Its scented flowers are welcome in the house; their colors are best in reds, white, and blues, and in beds they are very effective. It is easily grown from seed, though florists often start it from cuttings. The seed should be soaked in warm water before planting. Start it under glass in March or April, outdoors in May, sowing the seed somewhat shallow in rich soil that should, if possible, be clayey. The young plants, raised under glass, do best in pots; thin them in the seed bed to three inches; the permanent distances should be a foot or more apart. The stems strike root as they spread, and two feet apart is not too little.

Violets: These are perennials of many varieties, growing naturally in different kinds of soil, but usually doing well in ordinary garden loam. Wild ones may be transplanted. They are not commonly grown from seed, but from runners or from root-divisions. Set

them in their beds in spring or fall, six inches or more apart, and give clean culture. In winter they need protection of some kind; they will often bloom in very cold weather when under a cold-frame; but they need ventilation. Set in the edges of the border, or under shrubs, violets will usually increase from seed or runners without much care, and will blossom freely in the spring.

Wallflowers: Annual or perennial plants of considerable value for their old-fashioned effect in bedding; the flowers are yellows and browns, with modern varieties in white and red; they are sweet-scented, and are borne very freely in early summer. Sow early under glass, or outdoors after the middle of May; set the plants nine inches or more apart. Or sow freshly ripe seed of perennial varieties in summer, water well, and set out in September, protecting in winter. Wallflowers are tender.

Watermelons: Grown much like Muskmelons, except that they need more space, six feet if possible. For the north only the early varieties should be grown, except on very light and early soil, and after starting under glass. Do not let the plants set more than one fruit to a branch. The soil should not have much nitrogen, or they will run to vine.

Youth and Old Age, see *Zinnia*.

Yucca: A tropical perennial plant, which strangely enough is very hardy, and is worth having in the garden for the sake of its foliage alone, and the contrast of its stiff, sword-like leaves with the more graceful foliage of our northern plants. But besides this, Yucca flowers very beautifully, sending up in midsummer a tall stalk with clusters of waxy cream-white flowers, which are very handsome. It can be raised from seed, which should be sowed in any light soil in May, and planted out finally about the end of June, distances two feet or more apart. On the plants form offsets, which in spring may be cut away and set separately. These young plants may be bought of seedsmen. The exposure for Yucca should be sunny. Filamentosa is the variety which is most successful in the north; it is frequently called Adam's Needle.

Zinnia, sometimes called Youth and Old Age: A hardy annual, its blossoms most showy in many colors, easily grown, and worth having. Its kinds are dwarf, medium, and tall; single varieties are seldom sown, most gardeners preferring the double. The zinnia is a little stiff, and its colors are not so soft as those of the aster; but the ease with which it may be grown, and its brightness, make up for such defects.

Fig. 211. — Zinnia is very showy.

Zinnias may be sown indoors in April, and transplanted; but they are so easily grown out of doors that this trouble scarcely pays. Sow them outdoors in late April or early May, and thin them to a foot or more apart, according to variety. They transplant readily; indeed, they are stockier for transplanting; and they look finely in large masses, or in stiff lines marking a border. They flower from midsummer till frost. It is well to buy the named rather than the mixed varieties, and to pull out any plants whose colors do not harmonize. Zinnias like a strong and rich soil, and enjoy full sun.

PLANTING TABLE

THIS is intended to give general directions for garden work in the latitude of New York. Seasons will, of course, vary from year to year. For every hundred miles farther south, do the work a week earlier; for each hundred miles farther north, begin a week later. Height above the sea will also make a difference. Ask old gardeners in your town to set for you the two average dates: when the frost is out of the ground, and when the danger from frosts is past. These will help you to regulate your season.

No actual dates are here given, but the duties are arranged in about their proper order.

JANUARY

Order seed catalogue.
Make garden plans.
Order seed.
Send for nursery catalogues of shrubs and vines.
Test your seed.
Order strawberry catalogue.
Buy poisons and spray material.
Order strawberry plants for April delivery.
Get garden stakes in order.
Order roots of perennial vegetables and flowers.
Order gladioli, lilies, and dahlias.
Cut pea-brush.
Order wire and twine.
Get formaldehyde or flowers of sulphur for potatoes.
Balance your accounts.

FEBRUARY

Overhaul flats and frames.
Paint stakes, frames, and wheelbarrow.
Overhaul sprayer.

Store gladiolus and lily bulbs in damp sand.
Mix potting earth.
Scrub flower pots.
Keep account of all time spent on garden work.
Order new pots to replace broken ones.
Mend all broken tools.
Make cheesecloth frames for cabbage and cauliflower.
Balance your accounts.

March

Set your hot-bed pit-frame.
Temper your manure.
Pack manure in hot-beds.
Take hot-bed temperature daily.
Sow in hot-beds hardy flowers and vegetables.
Try small sowings of new varieties.
Watch hot-beds carefully till seedlings appear.
Start forcing a few hills of rhubarb.
Sow in hot-beds tender flowers and vegetables.
Sow radish weekly.
Sow lettuce every fortnight.
Set cold-frames, to warm the ground.
Balance your accounts.

April

Thin hot-bed plants.
When ground beneath cold-frames is thoroughly warm, prepare it for sowing.
Sow in cold-frames all hardy seed.
Finish hot-bed thinning.
Begin sprouting early potatoes in house or frame.
FROST OUT OF THE GROUND.
Sharpen your asparagus knife.
Sow in cold-frames tender flowers and vegetables.
Manure the asparagus and rhubarb.

Spade the asparagus and rhubarb lightly, so as not to hurt roots.
Manure the vegetable garden, and spade it.
Do the same to all unplanted flower-beds.
Uncover perennial flower-beds.
Roll the lawn.
Pot in hot-beds young peppers and eggplant.
Thin plants in cold-frames.
Transplant in hot-beds young tomatoes and celery.
Prepare protected seed bed out of doors.
Begin planting hardy seed outdoors.
Plant in garden sweet peas in trench.
Plant round-seeded peas.
Plant thick-leaved spinach.
Set shrubs and vines, and plant fruit-garden.
Plant dwarf wrinkled peas.
Set hardy perennial flower roots, with asparagus and rhubarb.
Transplant in frames all perennial seedlings.
Soak seed of beets and chard.
Sow French forcing carrots.
Sow beets and chard.
Keep a daily record of all hours of labor.
Remember to label everything you plant.
Sow under cheesecloth cabbage and cauliflower.
Sow late celery outdoors in seed bed.
Second transplanting of celery in frames.
Plant onion-sets in garden.
Begin general planting of all hardy seed.
Succession planting of dwarf wrinkled peas.
Sow a row of sugar peas.
Finish sowing of hardy seed.
Begin sowing half-hardy seed.
Succession planting of spinach, long-standing variety.
Set out young strawberry plants.
Risk a planting of early corn and beans.
Balance accounts.

MAY

Sow New Zealand spinach.
Plant lilies.
Plant Jerusalem artichoke.
Begin hardening off hardy seedlings in frames.
Sow beets fortnightly, also lettuce and cress.
Sow radish weekly.
Sow wrinkled peas, half-dwarf.
Plant out lettuce from frames.
Begin to thin your hardy seedlings in the garden.
Plant out hot-bed onions and early celery.
Watch for late frosts.
Finish sowing in garden all half-hardy seed.
Plant gladioli.
Prepare formaldehyde for potatoes.
Treat your seed-potatoes for scab.
Begin to harden off tender seedlings in frames.
Plant out early cauliflower and cabbage.
Cut your early seed-potatoes.
Plant early potatoes.
Plant tall peas.
Begin to sow summer lettuces, loose-heading kinds.
Set cannas and dahlia tubers.
Succession planting of corn and dwarf beans.
Set outdoors hardy seedlings from frames.
DANGER FROM FROSTS PAST.
Plant outdoors seed of cucumbers, squashes, melons.
Plant late seed-potatoes.
Bait for cutworms.
Set out from frames tomatoes and all squashes.
Sow bush limas and pole-beans.
Set out sprouted potatoes, eggplants, and peppers.
Last spring planting of radish and cress.
Balance your accounts.

June

Sow Romaine lettuces.
Sow pole limas.
Spray with Bordeaux, melons, squashes, cucumber.
Keep the weeds down.
Sow summer and winter radishes.
Finish planting out all tender seedlings from frames.
In spraying, reach all parts of the plant except the blossom.
Set out winter celery.
Thin all outdoor plantings.
Watch for cutworms.
Be sure all poles and trellises are set.
Begin spraying potatoes.
Fertilize asparagus after cutting.
Stake and tie your tomatoes.
Set out late cabbage and cauliflower.
Spray peppers and eggplant whenever you spray potatoes.
Pinch back cucumbers and marrows if they don't set fruit.
Put away frames and sash.
Prune tomatoes.
Cultivate regularly. (Don't brush against young beans when wet.)
Watch for the cabbage and onion maggots.
Spray potatoes whenever the old spray washes off.
Take up your tulips.
Balance your accounts.

July

Set out late celery.
Pick okra and kohl-rabi before they get stringy.
Prune your tomatoes.
Pinch back your melons and squashes if they run to vine.
Spray potatoes whenever the fresh tips show plentifully.
Keep the cultivator running.

Set strawberry runners in pots for transplanting.
Watch for squash-bugs' eggs.
Watch for the cabbage worm.
Order potted strawberry plants.
Prune your tomatoes.
Watch for corn-smut.
Pick squash bugs into kerosene.
Tie cauliflowers whenever the heads grow large.
Balance your accounts.

August

Sow endive for fall use.
Prune your tomatoes.
Two or three sprayings of potatoes are not enough.
Write for bulb catalogue.
Sow peas and lettuce for the fall.
Begin sowing crimson clover for a cover-crop.
Prune your tomatoes.
Order bulbs for fall delivery.
Plant Madonna lilies.
Transplant peonies.
Sow seed of such perennials as foxglove, larkspur, Canterbury bell.
Cultivate regularly through a drought.
Sow forcing varieties of radish.
Begin to dig early potatoes.
Sow winter spinach.
Balance your accounts.

September

Allow tomatoes to set no more fruit.
Watch for early frosts.
Set out your cold-frames.
Set lettuce and endive in frames.

Set boards alongside your early celery.
Begin potting house-plants.
Leave late potatoes as long as tops are green, except in a wet season.
Change cover-crop to winter vetch.
Begin earthing late celery.
Take up gladioli, cannas, and dahlias.
Dig potatoes as soon as tops are killed.
Transplant hardy perennials.
Balance your accounts.

October

Continue earthing of celery.
Begin planting and potting of bulbs.
In digging Jerusalem artichoke, leave none to sprout in spring.
Change cover-crop to rye.
Get carrots out of the ground.
Finish all transplantings.
Continue earthing up celery.
Lift lily-of-the-valley, and pot for winter.
Balance your accounts.

November

Spade all unseeded ground.
Begin to house winter celery.
Rake leaves, but don't burn them.
Bed your perennials with leaves or coarse manure.
Get all tools under cover.
Get in your sash.
Cover strawberries after a few heavy freezes.
Mulch winter spinach.
Balance your accounts.

DECEMBER

Be sure everything is neat about the place.

Balance your accounts for the month and the year.

Study your ledger account to see where you can do better next year.

Study your note-book and begin to make next year's plans.

THE DRAINAGE OF A GARDEN

DRAINING is nothing else than laying some material below the ground, in regular channels, to carry away water. Sometimes men are satisfied with digging ditches, laying in hay or straw lengthwise of the ditch, and covering again. That is very unsatisfactory, for the effect will scarcely last for more than a year. A better way is to fill the bottom of the ditches, to the depth of a foot, with cobble-stones, covering with sod or hay. This will last for some years; but since the earth will finally sift in, it is not permanent. Best of all is to lay drain-tiles, which are hollow earthen pipe, about two feet long. Sometimes the ends are shaped to fit each other, sometimes they simply meet squarely. In either case tar-paper, or sod, or something of the sort, is laid to prevent the earth from sifting in. Then the drains, if laid below frost, will last for years; and if by any chance they become clogged, they can be dug up, cleaned, and laid again.

The principle of laying drains is of course to lead the water to some lower level. Therefore the bottoms of the ditches should slope downward to some spot where the water can be discharged. Perhaps this is into a brook, or on to some low meadow. But the drains can be simply led into a "dry well," a deep hole, best in a sandy spot, which is dug, filled with stones, and then covered in. Into this the water drains, and from it it finds its way into the subsoil.

If you propose to lay the drain yourself, draw, on a map of the garden, on which you have marked the slope of the land, lines from twenty to forty feet apart, according to the sogginess of your ground. Make the lines run with the slope, connect them all at the bottom with another line, still running as nearly as possible with the slope, and so often somewhat diagonal to the first ones. Lead this line

to your dry well or your point of discharge, and your plan is made. If your garden has no slope, make a similar plan leading to the most convenient outlet.

All this must be, of course, drawn exactly to the proper scale, on which inches or half inches shall represent feet. Now take the map to the garden, and carefully lay it out, using compasses and measuring lines. Then carefully dig your ditches to the right depth. They should be at least two feet deep, since no water should stand higher than that in the soil. But tile drains are likely to be thrown out of line by the thawing and heaving of the frozen ground, so that they should be set below frost, which may be three feet or more. Old gardeners or stone-masons in your town can tell how deep the frost usually strikes into the soil in winter. The bottoms of the ditches should be carefully graded, preserving a regular slope all the way, with no pockets or cups in them. If possible, the lower part of the grade should be quicker than the first. The outlet ought to be above the level of standing water. To do all this is a delicate task; you must have a mason's level, and if you can work with a surveyor's, so much the better.

The tile should be carefully set in the ditches, and held in place by little stones. See that the ends fit exactly. For this purpose, the larger the tiles, the better. Three-inch tile is the smallest that it is wise to use in drains of any length, though for short runs you may use smaller. Where the branches of the drains join, use Y's rather than T's (that is, acute- rather than right-angle pieces). Cover each joint with tar-paper, sod (upside down !), or hay; and stop the end of the drain, if it is not to be covered, with galvanized netting. Then shovel in the earth all along the line, the subsoil first, the loam last.

If your soil abounds in large, flat stones, and you are clever in constructing a tunnel with them, you can get rid of the stones, and at the same time drain your land, without the cost of tile.

TRENCHING

THE loam of our gardens, except in very fortunate districts, is seldom more than a foot deep. Trenching is a method of deepening it by so enriching the subsoil that it turns to loam.

For this purpose we need to have at hand plenty of material for the purpose; that is, anything which in the course of a year or two will rot thoroughly. Manure is the best, but any vegetable matter, hay, cornstalks, weeds, the tops of our garden plants, no matter how coarse, is suitable for the purpose.

For a small patch or bed, the best method is to throw off all the loam, and spade the material into the subsoil, throwing the loam back again.

For the vegetable garden or a large bed such a process is too difficult, since the first foot of the ground would have to be moved twice. The method in such a case is as follows:

Imagine the garden cut into pairs of strips, each strip three or four feet wide. Imagine the strips, again, cut into squares of three or four feet. Then dig them as follows, beginning at one end of the first strip.

From the first two squares throw off the loam, and pile it at the end, near by.

From the first square throw out a foot of subsoil, and pile it.

From the second square throw the subsoil into the first square, mixing in the enriching material in layers, first a layer of the material, then one of subsoil, a few inches, then the material again, and so on. Use the material as freely as possible; the more you give, the richer the soil will be.[1]

Now from the third square throw the loam to the first square, and the subsoil to the second square.

From the fourth square throw the loam to the second square, and the subsoil to the third square.

[1] If, before you throw anything into each empty square, you spade some of the material into the ground below, so much the better.

From the fifth square throw the loam to the third square, and the subsoil to the fourth square.

Proceed in this manner to the end of the strip, always mixing your enriching material with the subsoil, when in the next to the last square you will have subsoil only, and in the last square, to the depth of two feet, you will have nothing.

Begin now the second strip, working *backward*. From the first square pitch the loam into the next to last square in the first strip, and pitch the subsoil into the last square in the first strip.

From the second square throw the loam into the last square in the first strip, and throw the subsoil into the first square in the second strip.

The trenching of the first strip is now complete, and the second strip is ready to be trenched, in squares, as the first strip was. Proceed with the work until at the end of the strip we find that the next to the last square has subsoil only, and the last square, to the depth of two feet, has nothing at all.

Into the last square pitch the pile of subsoil waiting from the first row.

Into both the last two squares pitch the pile of loam that is waiting from the first strip.

The pair of strips are now entirely trenched, and the earth, except that from the first two squares, has been handled but once. The subsoil has several layers of vegetable material which will rot and enrich it. Other pairs of strips can now be trenched until the work is finished. The surface will be rough, and can be left so over winter, or smoothed for immediate planting.

The work need not be done all at once, since it is laborious and expensive. It took me some years, working as I had time and material, to trench the whole of my garden.

TABLE OF THE LENGTH OF LIFE, AND THE SPACE VALUES, OF VEGETABLE SEEDS

(Flower seeds, except those of sweet pea and a very few others, are for small gardens usually bought by the packet, and usually a single packet is enough. For a small garden, also, a single packet of cabbage, cauliflower, and other such vegetable seeds is commonly enough. In the table, distances refer to ounces, unless quarts are named. The years show the time in which seeds are still strong enough to sprout.)

Artichoke, Globe. 5 yrs. 30 ft.
Beans. Pole string. 3 yrs. Quart, 150 hills.
Dwarf string. 3 yrs. Quart, 200 ft.
Pole lima. Quart, 100 hills.
Dwarf lima. Quart, 200 ft.
Beet. 6 yrs. 60 ft.
Brussels Sprout. 3 yrs. 3000 plants. Buy by the packet.
Cabbage. 4 yrs. 2500 plants. Buy by the packet.
Carrot. 5 yrs. 300 feet.
Cauliflower. 3 yrs. 3000 plants. Buy by the packet.
Celery. 7 yrs. 5000 to 10,000 plants.
Chard. 6 yrs. 50 ft.
Corn. 2 yrs. (Test beforehand.) Quart, 150 or more hills.
Cress. (Peppergrass) 5 yrs. 100 ft.
Cucumber. 10 yrs. 75 hills.
Eggplant. 6 yrs. 2500 plants.
Endive. 8 yrs. 200 ft.
Kale. 7 yrs. 250 ft. 2500 plants.
Kohl-rabi. 4 yrs. 200 ft. 1500 plants.
Leek. 2 or 3 yrs. 150 ft.
Lettuce. 5 yrs. 300 ft. 1000 plants.
Muskmelon. 10 yrs. 75 hills.

Okra. 5 yrs. 50 ft.
Onion. 2 yrs. 100 ft.
Parsley. 2 yrs. Packet is enough.
Parsnip. 1 yr. 400 ft.
Pea (including sweet pea). 3 yrs. Quart, 100 ft.
Pepper. 4 yrs. 2000 plants. Packet is enough.
Radish. 5 yrs. 125 ft. Summer and winter kinds, 3–400 ft.
Salsify. 2 yrs. 60 ft.
Sea-kale. 1 yr. 300 plants.
Spinach. 5 yrs. 150 ft.
Spinach, New Zealand. 5 yrs. 50 ft. 25 hills. Packet is enough. . . .
Squash. 4 yrs. Bush, 50 hills.
Running, 25 hills.
These figures include marrows.
Tomato. 12 yrs. 2000 to 2500 plants.
Get packets of two or three different kinds.
Turnip. 8 yrs. 2000 to 3000 plants.
Watermelon. Six years. 30 hills.

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By ALBERT RUSSELL MANN

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