WINDOW GARDENING

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WINDOW GARDENING

An Attractive Window Garden

WINDOW GARDENING

By

HERMAN B. DORNER

WITH

ILLUSTRATIONS FROM PHOTOGRAPHS

INDIANAPOLIS

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TO MY FATHER

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AUTHOR'S PREFACE

In presenting this book to the public, it has been the aim of the writer to give such cultural directions as will enable the inexperienced to overcome most of the difficulties which arise in the growing of plants in the window garden. An extended experience in the handling of house plants has led to a recognition of the causes underlying these difficulties, and an effort has been made in the following pages to suggest methods of treatment which will enable the grower to care for his plants intelligently and insure a fair measure of success. Of course, if the grower still insists upon dosing his plants with castor-oil or watering them with boiling water, or using various chemical nostrums, he need not be disappointed if his attempts result in failure.

As this book is intended for general use it must of necessity be extremely concise in statement and somewhat restricted in scope, but, with a little thought, the directions here given may easily be varied to fit any ordinary conditions.

In the chapters on flowering and foliage plants, only the more common and suitable forms are discussed. Besides those enumerated, many other and rarer forms may be found which are suitable for the window garden, but these are so little used that they have been omitted.

The cultural directions given are equally applicable

to the window garden and the small conservatory. It is hoped that the book will commend itself to school-teachers and owners of small conservatories, as well as to the grower of plants in the windows of the dwelling.

The photographs used for the illustrations were prepared, under the direction of the author, by Mr. O. L. Foster, a commercial photographer of Lafayette, Indiana.

The writer also wishes to acknowledge his indebtedness to Professor Stanley Coulter for many kind suggestions and criticisms.

HERMAN B. DORNER.

Lafayette, Indiana.

EDITOR'S PREFACE

There exists at present a fair consensus of opinion as to the significance and limitations of nature study. As a result of this agreement pedagogical values are being rapidly worked out, and the subject has passed from the experimental stage into an assured and important position in the schools. While it is now generally recognized that the materials used in nature study not only may, but should, vary widely, since the conditions surrounding schools in different localities are variant, the fact remains true that in the main a large part of this material will be drawn from plant and animal life.

Because of the more definite and clear-cut conceptions of the function of nature study in our educational system there has arisen a demand for a literature of the subject differing somewhat widely from that of former years,—a literature which shall treat concisely, yet clearly and comprehensively, the methods which underlie the successful use of certain specific materials, and which will at the same time serve to suggest methods of organizing other material. This hand-book is an attempt to meet one of these imperative demands.

The attempt upon the part of teachers in charge of nature-study work to grow plants in the school-room is almost universal, and the failure to secure satisfactory results is almost equally universal. Such work is not merely attractive, it is highly educative, and *Window*

Gardening is issued in the hope that through fuller knowledge of the vital necessities of growing plants, of the adverse conditions which obtain in the school-room, and of the enemies more commonly attacking house plants, these frequent failures may be avoided.

The author, Mr. Herman B. Dorner, has especial fitness for the work assigned him, not only because of a thorough scientific training, but also because of years of practical experience in the handling of plants in an establishment of wide reputation for its successful methods in plant-breeding and culture. It will be seen that the book appeals as strongly to those growing plants in the home or in small conservatories as to teachers, and to all such it is also commended with confidence as of high practical value.

STANLEY COULTER.

Purdue University, August 1, 1907.

WINDOW GARDENING

WINDOW GARDENING

INTRODUCTION

WINDOW GARDENING IN GENERAL

Of late years the reports of the florists show a renewed interest in window gardening. More plants for this purpose are purchased each season and the demand for new varieties increases from year to year. To supply this demand, the florist is each year adding to his stock many new forms which are vastly superior to the forms grown a quarter of a century ago.

Not only do well-grown plants add beauty to the house, but their care affords to their owner a restful relaxation from other duties. The attention given to the plants from day to day, the noting of additional growth and the development of the flowers, afford many pleasant moments when the outer world is covered with snow.

WINDOW GARDENING

CAUSES OF FAILURE

There are three causes to which may be attributed nearly all failures in window gardening. The first of these is a lack of knowledge of the vital necessities of plants. Many people think that thrusting the plant or seed into the soil is all that is necessary, little realizing that the plant requires food and water and that when the supply of these in the soil is exhausted, a new supply of each must be provided. One should know something of the habits and necessities of plants in order to be able to care for them in an intelligent manner and to secure the best results.

SELECTION OF PLANTS

The second cause of failure is the selection of plants unsuitable for the rooms in which they are to be kept. The chief unfavorable conditions to be contended with in the window garden are dry air, dust and uneven temperature. The plants selected should evidently be forms able to withstand these conditions.

INTRODUCTION

The temperature and light conditions should also be considered in the selection of plants. If the rooms are so warm as to be unbearable to the average human being, it is folly to expect success with plants requiring a cool atmosphere. On the other hand, forms requiring a rather high temperature will not do well in a cool room.

It should be remembered that where the windows receive no sunshine, it is almost useless to attempt to grow the ordinary flowering plants; it is far wiser to select shade-loving foliage plants. Study the requirements of the plants, study the exposure of the windows and then select those forms which are suitable for the conditions.

In making a selection of plants it should be taken into consideration that a number of forms offered by the florist are merely temporary additions to the window garden and that when their flowering season is over they should be discarded. They are intended to serve the same purpose as a vase of cut flowers, having, however, a much longer period of attractive-

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ness—a point which is valuable and well worth considering.

NEGLECT

The third and probably the most common cause of failure is neglect. Plants require as careful attention as do pet animals, and should receive daily care. A few days of neglect may permanently ruin a handsome specimen. It does not lengthen the life of a plant to water it at those occasional times when it happens to be remembered; if the plant lives and thrives, it should receive the proper amount of water at the proper time. This does not mean that it should be watered every day but that it should be looked after every day and watered when necessary.

CHAPTER I

CONTAINERS

One of the first requisites in order to secure the best results in plant culture, is to know something about the vessels in which plants may be grown and how these vessels should be used. There are reasons why, in the majority of cases, some vessels give better results than others, and the knowledge of these reasons should determine the type of containing vessel selected.

EARTHEN POTS

Perhaps of all the vessels upon the market for plant growing, the common unglazed earthen pot, used by the florist, is the best. Its porosity, convenient shape and numerous sizes, make it preferable to all others. These pots are made of a uniform and convenient shape which

WINDOW GARDENING

allows the ready removal of the plant without any injury to the roots, and greatly facilitates transplanting.

The pot should be porous for at least two reasons. First, it allows the surplus water to evaporate from the outer surface and thus helps

Fig. 1. The standard pot, the azalea or fern pot and the seed pan

to keep the soil sweet by causing it to dry out more rapidly; second, it allows the air to enter the soil and so come in contact with the roots. Any form of glazed pot, therefore, which will prevent the evaporation of the excess of moisture from the soil and which will exclude the air from the roots should be avoided.

CONTAINERS

Avoid the use of all pots which are burned so hard as to make them impervious. All painted pots should also be rejected as the paint closes the pores. Both of these types produce the same results as glazed pots.

KINDS OF POTS

There are several kinds of pots manufactured and each has its uses. The first to be considered is the standard pot, the one most commonly used both by florists and amateurs. (Fig. 1.) This pot is made with a depth equal to the diameter at the top. The standard is used for nearly all kinds of plants and especially for those which have large and deep root systems.

The second type is the azalea or fern pot, which has a depth of about three-fourths the diameter at the top. (Fig. 1.) These pots are especially valuable for such plants as have shallow root systems and for the forcing of many kinds of bulbs.

The third type is the seed pan. These are made quite shallow and are used for growing

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seedlings and small bulbs, such as the crocus. Seed pans either round or square in shape are upon the market.

These three types of pots are the most desirable for use in plant culture in the window garden.

DEVICES FOR CATCHING DRIP

Wherever pots are used some provision should be made for catching the drip or surplus

Fig. 2. A good drip catcher

water from the opening in the bottom. Where only a few plants are grown and when they are

CONTAINERS

not massed, the individual saucer is the best. The saucers are made of the same material as the pots and in corresponding sizes. (Fig. 2.)

Where several plants are to be grown in the same window, a tray of zinc or galvanized iron may be made to fit the space utilized. This pan should be made water-tight and should have a depth of at least two inches. It should be filled with sand and the plants set upon it. The sand absorbs all of the surplus water drained from the pots. The frontispiece shows the use of such a tray.

There are several advantages in this device. First, it prevents the soil from drying out too rapidly; thus keeping a more even degree of moisture and so benefiting the plants; second, it allows of spraying without wetting the floor; third, it aids in keeping the atmosphere moist.

WINDOW BOXES

Where it is desired to fill the entire window with plants, boxes may be used to advantage. These are often advocated since when filled with a number of different plants well selected

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and well cared for, they make an exceedingly attractive window. However, boxes have their disadvantages. Their large size makes them difficult to handle, a fact annoying when a fall in temperature makes removal from the window a necessity. Again, unless the box is so shaped as to permit turning about, the plants will have a tendency to turn toward the light and thus present a bare side to the room. Plants in pots, on the other hand, may be turned often to secure a symmetrical growth.

Window boxes may also serve another purpose. Where it is desired to keep the plants in pots, the boxes may serve as receptacles for moss or sand in which the pots may be partly buried. In this way the box serves the same purpose as the tray filled with sand.

STRUCTURE OF WINDOW BOX

If a box is used it should have a width of from eight to fourteen inches; its length being determined by the window space. The inside depth should not exceed five inches. These boxes may be made of ordinary lumber and

CONTAINERS

either painted or covered with paper or cloth.

Several holes should be bored in the bottom of the completed box to provide for the draining off of any surplus water from the soil. This necessitates the provision of some device to catch the drip. This may be best accomplished by the use of a galvanized iron or zinc pan made just a trifle larger than the box. In placing the box in the pan, put a small block under each corner in order to raise the base from one-half to one inch above the bottom of the pan. This prevents the box from standing in the water. The pan should be provided with some device for draining off the water, or made sufficiently large to permit its removal by means of a sponge.

HANGING BASKETS

Hanging baskets are always an attractive addition to the window garden, in which they may be suspended either from the ceiling or from brackets upon side walls. In summer they may be removed from the window and used to ornament the porch.

WINDOW GARDENING

Certain trailing plants show to their best advantage only when grown in suspended baskets.

KINDS OF BASKETS

Hanging baskets of several different kinds are found upon the market. Earthenware baskets both in plain and rustic shapes are often

Fig. 3. A rustic basket filled with *Tradescantia*

used. One of the favorite types is that made of wire. (Fig. 32.) When filled, it should first be lined with sheet or wood moss with the upper

CONTAINERS

side out. Where wood moss can not be secured, the basket may be lined with sphagnum moss, such as the florists use in packing plants for shipping. This is not so satisfactory, however, as the sphagnum is made up of loose pieces, which are liable to slip between the wires. After lining, the basket should be filled in the same way as an ordinary pot. Both sheet and sphagnum moss may usually be secured from the florist. Sheet moss may often be found in dense woods, growing over decaying logs.

Square rustic baskets may also be purchased, or they may be easily made from pieces of branches or saplings from one-half to three-fourths inches thick. The corners should be held together by a wire passing through them and made doubly secure by nailing. Rustic baskets should be lined with moss in the same manner as wire baskets. Fig. 3 shows a home-made rustic basket.

Where it is impossible to secure a regular basket, an ordinary flower pot may readily be converted into a basket by the use of wire pot-hangers.

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FERNERIES

Ferneries when properly made consist of two parts: an inner porous one, in which the ferns are planted, and an outer part, usually decor-

Fig. 4. A fernery with an inner part to hold the plants
ated. The inner part is provided with holes in
the bottom for drainage while the outer one is
watertight to prevent the water from running

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over the table upon which it is placed.

Where the fernery is not provided with an inner pot, this lack may be remedied by having one made of tin or zinc. Care should be taken to see that it is so constructed as to permit of easy removal and that it is provided with several holes for drainage. When such receptacles are used, watering must be done very cautiously as there is danger of over-watering.

JAPANESE POTS AND TUBS

The decorated, glazed pots of the Japanese type that are provided with holes in the bottom, may also be used, but care in watering must be observed in this case also.

Where the plant is of a large size, a wooden tub with handles makes a good container.

OTHER DEVICES

Many have great success in growing their plants in old tin cans and buckets but the success in such cases is due to the care, since a plant grown in a tin can and well taken care of will thrive much better than one in the best

WINDOW GARDENING

Fig. 5. A useful jardinière

CONTAINERS

of pots which is neglected. Such improvised containers should be provided with good drainage and care should be exercised in watering.

JARDINIÈRES AND THEIR USES

Jardinières are not made to hold soil but to hold pots in which the soil is placed. They are nearly all glazed and are never provided with outlets for water. In addition to being ornamental, they also serve to catch the drip from the pot and to prevent excessive evaporation.

NECESSITY OF DRAINAGE

Whatever the type of the vessel in which plants are grown, there should always be openings in the bottom to permit the escape of the surplus moisture in the soil after watering. When the proper drainage is not provided, the soil becomes water soaked, the air is prevented from coming in contact with the roots, the soil becomes sour and the roots die. As a result, the plant begins to droop, loses its leaves and soon dies.

CHAPTER II

POTTING

It is too often thought that, in potting, all that is necessary is to place the plant in the pot, throw in a little soil, press it down lightly and the work is done. This may answer for some very hardy plants, but most of them are liable to suffer from such treatment. To do potting with any degree of intelligence and assurance of success one must know something of the requirements of the plants under the special conditions involved.

EFFECT OF THE SIZE OF POT

In potting the first thing to do is to determine the size of the pot required by the plant. It is often thought that by giving plants large pots and plenty of soil, they will grow much better. This is a mistaken idea. A plant grown in a

POTTING

pot should have just enough soil to secure its best development. Where the pot is too large, the amount of soil is too great and holds more water than can be used by the plant. As a result, the soil remains wet for a long time and becomes sour and where the soil becomes sour, decay of the root soon follows and the plant, instead of thriving, drops its leaves and soon dies.

It is much better to use smaller pots and as the roots fill them, to shift the plants to larger pots. In this manner the amount of soil is not too great and the conditions are under better control. The growth is also more rapid and in the same length of time a much greater size is attained. On the other hand, pots which are too small should not be used, as the amount of water the soil will hold is soon exhausted and, unless carefully watched, the roots will be killed by becoming too dry.

WHAT DETERMINES SIZE OF POT

The size of the pot is determined by two things — the size of the root system and the size of the top. If the plants are already growing

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in pots and the roots are becoming matted in the bottom, it is time to shift to larger pots. The condition of the roots may be easily determined by turning the plant out of the pot. When ready for shifting the pot selected should be a size or two larger than the old one.

When the plant is one that has just been lifted from the garden, the pot selected should be sufficiently large to receive the roots without crowding. If any variation from this is necessary it is better to have the pot a little smaller than would seem to be required until the plant is well established.

VALUE OF GOOD DRAINAGE

One of the essential things in potting is to provide good drainage. By this it is meant that the surplus water must have a chance of escaping easily from the soil. Where the drainage is poor, the excess of water is held in the pot and prevents the air from reaching the roots. The result of this is that the small feeding roots are killed, decay follows and extends to the larger roots and growth ceases. Poor

POTTING

drainage is also the most frequent cause of sour soil in pots.

HOW DRAINAGE MAY BE SECURED

There are numerous ways in which good drainage may be secured. Where the plant is a strong grower, all that is necessary is to place a single piece of broken pot over the bottom. This piece should be two or three times the diameter of the opening and should be placed with its concave side down. This prevents the opening from being closed entirely and the water escapes easily under the edges. This method is all that is necessary for three to four inch pots and is usually all that is required for larger pots where the plants have large and strong root systems. Pots from two to three inches in diameter require no drainage, as both the openings and the amount of soil are small.

The best method to secure perfect drainage and the one that should be used for all slow-growing and woody plants, is to place a fragment of an earthenware pot over the bottom as indicated above and then to cover this fragment

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with smaller pieces. This allows a free passage of the water and also permits air to enter and come in contact with the roots.

Many other materials may be used for this purpose. Where broken pot pieces are not available, soft brick, broken into fragments the size of filberts, forms a good substitute. Charcoal makes an excellent material for this purpose and gravel, sphagnum moss and cinders may also be used.

An inch of drainage material is all that is necessary for a five or six inch pot. For all sizes over six inches in diameter about two inches should be used.

SHIFTING OF PLANTS

By shifting is meant the transfer of plants from smaller to larger pots. This should be done whenever the roots have filled the old pot. If it is not done the plant becomes pot-bound and this is followed by a stunted growth, the production of small leaves and the loss of the older ones. In some cases, as with certain blooming plants, it is best to let the plants be-

POTTING

Fig. 6. Shifting; ready for the new pot.

come pot-bound as it is only under such conditions that they bloom freely. In this case instead of shifting the plant it is fed freely.

If the plant to be shifted is in a healthy growing condition use a pot a size or two larger than the original container, being governed of course by the size of the plant.

REMOVAL OF PLANT FROM POT

The first operation, in shifting, is to remove the plant from the pot. To do this place the left hand over the top of the pot with the stem

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between the index and middle fingers. This is to prevent the plant from falling when it loosens from the pot. Now grasp the pot firmly with the right hand, invert and strike the rim a sharp blow on the edge of some wooden object. This jars the ball of earth loose from the pot, which, as it falls, is held by the left hand. (Fig. 7.)

Never cut a plant out of the pot; in doing so many of the larger roots are cut and injured.

SHOULDERING

The next operation is to "shoulder" the ball. In doing this, remove with the thumb and forefinger all of the soil from the top of the ball down to where the main mass of roots begins. The object is to remove as much of the old soil as possible and to replace it with new, thus securing all the benefit possible from the shift.

LOOSENING OF ROOTS

The roots at the bottom should next be loosened in order to bring them more closely in contact with the new nutrient mixture. If the

Fig. 7. Removing a plant from the pot

WINDOW GARDENING

plant has a dense mat of roots surrounding the ball, tear off most of the fine ones. This causes the old roots to "break" sooner, thus sending numerous feeding roots into the new soil. Fig. 6 shows an asparagus plant prepared and ready for planting.

POTTING THE PLANT

Having prepared the plant for shifting, place the drainage material in the larger pot and add some soil. Press this soil down firmly and then place the plant in position, using care to spread the loosened roots somewhat. When resting on this cushion of soil the old ball should be just a trifle lower, for most plants, than it was in the old pot. Now, holding the plant in position with one hand, add a small amount of soil with the other. Still holding the plant carefully in position, raise the pot about an inch or so from the table and bring it down with a sharp rap in order to jar the soil into place. After jarring the soil into place, pack it down gently but firmly with a thin stick. Keep adding more soil and packing until the pot is

POTTING

full. After adding the last soil finish packing by using the thumb and fingers. (Fig. 8.)

Care should be taken to leave enough space

Fig. 8. The potting of a cutting

between the surface of the soil and the top of the pot for water. For a six-inch pot there should be a space of at least three-fourths of an inch and in other sizes a proportional space should be left.

IMPLEMENT FOR FIRMING THE SOIL

The stick used for firming the soil should be thin enough to pass readily down between the ball of soil and the sides of the pot. If too

WINDOW GARDENING

large it will break and injure the roots. A good form may be made by using a thin piece of board about one inch wide and whittling it down to about three-sixteenths or one-fourth of an inch in thickness. (Fig. 6.)

POTTING OF SMALL PLANTS

In potting small plants with no soil on the roots, as in the case of cuttings, the soil is "firmed" entirely with the thumbs. The pot should be filled from one-half to two-thirds full of soil, the amount depending upon the depth to which the plant is to be inserted. After pressing the soil down firmly with the fingers, place the plant in position, using care to spread the roots, and then fill the pot with soil. Now grasping the pot tightly, as in Fig. 8, pack the soil down firmly with the thumbs, being careful not to press against the stem. If the pot is not full enough after this operation add more soil.

TRANSPLANTING FROM GARDEN

Plants which have been growing in the garden during the summer and which are to be

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used in the window garden during the winter, should be lifted at least two weeks before being taken inside and should not be allowed to become frosted. Lift the plants carefully with a spade, going rather deep so as to secure a good mass of roots. If a large amount of soil clings to the roots, the ball should be reduced in size until it is less in diameter than the pot in which it is to be placed. The size of the pot to be used must be governed by the size of the root system and should be sufficiently large to preclude danger of crowding the roots.

The operation in this case is the same as that employed in shifting, except that the fingers are more used in packing the soil, especially in cases where the soil has fallen away from the roots. Care should be taken to set the plant in the center of the pot.

Water thoroughly and keep out of doors in a shaded place until there is danger of frost.

REPOTTING

Plants that are sickly looking, because of sour soil, drying out, over-watering, freezing or in-

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sects, will often recover if repotted. By repotting is meant the removing of most of the old soil and potting again in the same or a smaller pot. To do this remove the plant from the pot and, by means of the fingers, break away most of the old soil. If many of the roots have decayed, the rotted parts should be cut off. When the root system has been greatly reduced by this operation the plants should be placed in smaller pots until they recover.

After repotting, the plant should at first be thoroughly watered and afterward more sparingly until it shows signs of recovery.

REPOTTING OF DORMANT PLANTS

The best time to repot a dormant plant, or one that has a resting period, is just before growth begins. The next best time is just before growth ceases. The object is to give it as much fresh soil as is possible when it is forming new roots. Knock the plant from the pot and remove all the soil possible without injury to the main roots. Loosen the roots and replant in the same pot or one a size larger, water

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thoroughly at first and then more sparingly until growth has begun. (Fig. 9.)

Fig. 9. A dormant poinsettia pruned and ready for repotting

POT-BOUND PLANTS

Where plants in large pots have become pot-bound and it is not desired to shift to larger pots, they may be kept in a good condition by the application of liquid fertilizer.

CHAPTER III

SOILS

Soil, or the substance in which plants are grown, is composed mainly of minute fragments of mineral matter and decayed vegetable and animal matter. In the life history of the plant it serves three purposes. First, it acts merely as a medium of support in maintaining the position of the plant; second, it serves as a reservoir for the storing of water for the use of the plant; third, it is the source of the mineral elements which go to build up the plant structure.

TYPES OF SOIL

Soils, as considered by the florist, are of three main types, namely: sand, clay and humus. Various combinations of these three types give soils suitable for all plants.

Fig. 10. The effect of different soils upon plant growth. The geranium in (1) black loam, (2) clay, and (3) sand

SAND

A sandy soil is one which contains from 80 to 100 per cent. of pure quartz sand. A soil of this type furnishes very little nourishment and although it absorbs a large amount of water it dries out very readily. Sand forms the best medium in which to root cuttings, for cuttings require little or no nourishment until roots are formed. Again, fungus diseases do not de-

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velop so readily in sandy soils—a fact of great importance in growing cuttings and seedlings.

CLAY

A clay soil contains from 10 to 20 per cent. of sand and, without the admixture of additional sand, makes a poor soil in which to grow plants. Although it contains an abundance of nutrient substances and absorbs a great deal of water, both are held so tenaciously by the soil particles that they are taken up with difficulty by the plant. The roots, also, have difficulty in penetrating the soil, owing to the compactness due to the extremely small size of the soil particles. Mixed, however, with some substance that will increase its porosity it makes an ideal soil.

HUMUS

Humus is decayed vegetable matter and may be divided into two classes—vegetable mold and peat. Vegetable mold or leaf mold, as it is commonly called, is composed of plant remains decayed in comparatively dry earth, as in the surface coverings of the forests. Peat, on the

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other hand, is made up of the remains of plants decayed under the water of bogs and swamps.

Neither form of humus can be used alone, as both are deficient in certain nutrient substances necessary to secure good growth. Although too light and open to be used alone, they are excellent to mix with stiffer soils in order to make them more porous.

MIXED SOILS

The largest part of our soil does not belong to any of these three types but is a mixture of them. A mixed soil is the one that gives the best results as it contains not only the substances necessary for good plant growth, but also the proper physical properties. Some soils are in fairly definite combinations, and have special names.

LOAM

A *loam* is a soil containing from 40 to 60 per cent. of sand, the remainder being clay. Often a part of the clay and sand is replaced by humus and the soil has a black appearance. This is spoken of as *black loam*. A loam of this kind makes a suitable soil for most plants.

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SANDY LOAM

Where the soil contains from 60 to 80 per cent. of sand, it is called a *sandy loam* and makes an excellent soil for succulent plants.

CLAY LOAM

A soil that contains from 20 to 40 per cent. sand is called a *clay loam* and makes a good foundation soil for large and strongly rooting plants.

WHERE TO SECURE SOILS FOR POTTING

Good soils for potting purposes may be secured in most gardens and cultivated fields, but the best is prepared by cutting thick sods, piling them up and allowing them to rot. A compost heap so formed should be allowed to stand at least six months so as to have it well rotted. Where this is impossible the sod should be thoroughly broken up and shaken out so as to secure and retain all the fibrous parts possible. The only part to be discarded is the heart or crown which is likely to grow again under favorable conditions.

SOILS

Leaf-mold may be secured in any uncleared wood where the leaves have a chance to decay. The upper partly decayed leaves should be removed and the light soil just beneath secured. Leaf-mold from a forest of soft or mixed forms is much to be preferred to that from an oak forest, as the latter contains a considerable amount of tannin. In securing leaf-mold the decayed remains of old logs or stumps *should not be taken* as they are of little value.

Peat may be collected from a bog or swamp, but it is best to secure it from a florist, already prepared for use. It is used for practically the same purposes as leaf-mold.

SIFTING OF SOIL

No soil for potting purposes should ever be sifted unless it is for very small pots. Even then it is best when broken very fine and unscreened. When screened the sieve used should never be finer than four meshes to the inch. Screening has a tendency to make the soil so fine that in potting it packs too closely and soon cakes and becomes very hard. When

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merely broken up the small pieces help to keep the soil open and porous. Soil should never be screened when wet.

SOILS FOR POTTING

Although most plants require a special kind of soil, there are three types that may be used for all kinds of house plants. Some growers advocate the use of one kind of soil for all house plants and while most plants will grow in the ordinary garden soil, the best results can only be secured by the use of specialized soils. Three formulas which may be easily prepared are here suggested.

Formula No. 1.—To three parts of rotted sod or good garden soil add one part well rotted stable manure; cow manure to be preferred. Where the soil used is a rather heavy one, one-half part of sand may be added. Mix thoroughly so that the manure is well broken up and evenly distributed.

This soil is best adapted for rapidly growing plants, such as the geranium, but where only one

kind of soil is to be used it will be found to serve well for most plants.

Formula No. 2.—To two parts of loam add one part leaf-mold or peat. If a clay loam is used instead of a loam, one-half part of sand should be added and the mass should be thoroughly mixed.

This forms an excellent soil for plants such as ferns, azaleas, and begonias, which have numerous fibrous roots. Plants of this type require little or no fertilizer as long as the soil is not worn out.

Formula No. 3.—To two parts clay loam add one part well rotted manure, mixing thoroughly to secure perfect distribution. This gives a rich and rather heavy soil suitable for roses, palms and similar plants.

When well-rotted stable manure is not to be had and it is necessary to depend upon chemical fertilizers in the formulas calling for manure, some sand should be added to lighten the soil. Chemical fertilizers should be added according to the directions accompanying them.

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MOISTURE CONDITION OF POTTING SOIL

Care must be taken not to have the potting soil too wet or too dry. If the soil is too wet there is great danger of packing it so tight in the pots that the roots have great difficulty in penetrating it. If, on the other hand, it be too

Fig. 11. Result of using wet soil

dry it can not be packed firmly enough. Fig. 11 shows a hyacinth that was potted in wet soil which packed so hard that the roots, being unable to penetrate it, lifted the bulb out of the pot.

SOILS

Soil, to have the correct degree of moisture, should readily fall apart again after having been compressed in the hand, yet should be moist enough to retain its form. Under no conditions should wet soil be used for potting purposes.

CHAPTER IV

WATERING

Watering, more than any other one factor, determines success or failure in window gardening. Where little attention is given to the watering and the plants are only cared for when the owner happens to think of them, poor plants are always the result. On the other hand, many failures are due to over attention to this detail. To secure the best results the plants must be kept under constant observation and watered whenever they require it and then watered thoroughly.

RESULTS OF OVER AND UNDER WATERING

The results of over- and under-watering are almost identical, as both end in injury to the root-system and a loss of the leaves. Where a plant is over-watered the root-system is unable

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to absorb all of the moisture, the soil becomes water-soaked, air is excluded and, as a result, the roots decay. As the root-system decreases, the leaves which are dependent upon it for their food soon turn yellow and fall. On the other hand, where the plants have insufficient moisture the roots dry up and the foliage drops off little by little until only that amount remains that can be supplied by the limited quantity of water available.

WHEN TO WATER

The best method to determine when a plant requires water is to rub some of the soil between the fingers. If, in this rubbing, the soil pulverizes without caking, the plant should be watered, even though the soil appears to be moist. If, on the other hand, the soil cakes, it requires no water. The soil should never be allowed to become so dry that it becomes hard, as this tends to check the growth of the plant.

HOW TO WATER

If the plant requires moisture, water thoroughly or until the water comes through the

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opening below. Fill up the pot and allow the water to soak in and if this is not enough add more water. Do not water again until the soil

Fig. 12. The effects of neglect

pulverizes between the fingers even if a week or two intervenes before this condition is reached.

TEMPERATURE OF WATER

The water used should be of the same temperature as the room in which the plants are kept. Cold water should not be applied but should in all cases have the chill taken off before

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using. Cold water checks root action and so retards growth. Never use hot water on plants, as it will kill the feeding roots by scalding. Some plants, as the calla, can stand fairly warm water, though it should not be hot, but such plants are exceptional.

THE WATER

In watering use nothing but clear water, unless some form of liquid fertilizer is being applied. Avoid the use of ammonia and similar chemicals, as they are almost universally detrimental to plant growth.

REMOVAL OF THE DRIP

After the plant has stood for a time and has had a chance to drain off, the excess water in the saucer or jardinière should be removed. Water may easily be removed from a saucer by means of a sponge.

Where the plants are standing on a tray of sand, the sand will absorb the excess water and will then give it off to the air. The water thus

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given off by the sand aids in keeping the atmosphere moist.

SYRINGING

Where practical it is well to syringe all plants except those having heavy coverings of trichomes (hairs) on the surface of the leaves. Plants with a heavy covering of trichomes should not be syringed but watered by filling the pot as described in a previous paragraph.

Syringing aids in keeping the foliage clean and the stomata, or breathing pores, open,—conditions that are essential if the leaves perform their functions. It also serves to prevent the attacks of most insects and is an efficient remedy where the plants are already infested.

Plants set on a tray of sand may be sprayed to a limited extent, but if the work is to be thoroughly done they should be removed to a sink or bath-tub. Here they may be sprayed either with a sprinkling can or with the spray from the bath-tub. Too great a head of water injures and breaks the foliage.

On a warm day the plants may be removed to

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the yard and sprayed with the hose. Where this is done a nozzle should not be used, but the water should be applied by placing the thumb

Fig. 13. The Cyperus

lightly over the opening. This spreads the water without giving it any great force and the drops fall on the leaves like a gentle rain. A

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nozzle should never be used either on plants in pots or those in the garden.

WASHING OF LEAVES

Plants with large and tough leaves, such as palms and rubbers, should occasionally be washed. These leaves are large and the dust accumulating on them soon clogs up the stomata. Wash with a sponge and use clear water only. Do not rub the leaves as the dust is easily removed by passing the wet sponge lightly over them. This should be done whenever the leaves lose their bright green color.

CHAPTER V

FERTILIZERS

CHEMICAL ELEMENTS NECESSARY FOR GROWTH

For the development of all plants certain chemical elements are necessary. These are secured from two sources, namely from the air and from the soil.

The essential constituents of plant-foods are carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorus, potassium, calcium, magnesium, and iron. Other elements are taken up by plants but are not considered essential as plant growth will occur without them.

Of these food constituents, carbon and a part of the oxygen are taken from the air. The carbon is taken up by the leaves in the form of carbon dioxide.

The remainder of the elements are secured from the soil. Of these, phosphorus, potassium

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and nitrogen are likely to occur in the soil in insufficient quantities. Where the soil is deficient in these forms of plant-food their lack must be supplied by the use of fertilizers con-

Fig. 14. The effects of exhausted soil

taining them or else the growth of the plant becomes retarded and it fails to reach its normal size and development.

Where the amount of soil for each plant is

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limited, as is the case where they are grown in pots, it soon becomes exhausted and the necessary elements must be supplied either by the addition of fresh soil or by treating with some soluble plant food. (Fig. 14.)

APPLICATION OF FERTILIZERS

Fertilizers may be applied either by mixing directly with the potting soil or in liquid form when the plant has become well established. Fertilizers which require decomposition to render their constituents available must be added to the soil.

KINDS OF FERTILIZERS

Fertilizers are of two kinds known as natural manures and chemical fertilizers. By natural manures are meant the cleanings from horse-stables, cow-barns or hen-coops, mixed with decaying vegetable remains of various kinds.

When added to the soil natural manures serve two functions. First, they add directly to the available soil supplies of potash, phosphates and nitrogen; second, natural manures, and espe-

cially those containing much decaying vegetable matter, improve the physical properties of the soil. Their use renders the soil more open and porous, a condition allowing a ready movement of air and water, a matter of great importance in plant growth. Natural manures also aid in retaining the moisture.

Chemical fertilizers or manufactured plant-foods merely add to the fertility of the soil and as a rule they do not modify its physical properties.

NATURAL MANURES SHOULD BE WELL ROTTED

Natural manures should never be used in potting soils except in a well-rotted state. Where fresh manure is used, fermentation may take place and prove injurious to the plants. Manures when rotting undergo a process of fermentation which makes the plant-foods which they contain readily available.

The use of any manure that has become overheated in decaying should be carefully avoided as it has lost its value.

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NATURAL MANURES FOR POTTING

Of the natural manures, cow manure is the best for use in potting soil. However, where this is not available, well-rotted horse manure may be used. Hen and sheep manures should not be used in potting soils. These are so strong, especially in nitrogen, that they are injurious if applied too freely. It is best for the amateur to avoid them and so escape possible trouble.

Well-rotted manures used in potting soils, should be broken up and thoroughly incorporated with the soil. Where the manure is too wet to be handled conveniently, first mix it with the soil so that some of the moisture may be absorbed. After it has been allowed to stand for a time it may be broken up with the soil.

USES OF CHEMICAL FERTILIZERS

For house plants chemical fertilizers often prove the most satisfactory. These prepared plant-foods are of known strength and contain the three elements which are most liable to be lacking in the soil. (Fig. 15.)

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Fig. 15. Same plant as in Fig. 14, six weeks later, after four applications of chemical fertilizer

Chemical fertilizers may be used either in the potting soil or applied in a liquid form. Where used in a liquid form it is especially valuable for plants which require additional plant-food but which one does not care to shift so as to give them new soil.

Chemical fertilizers or plant-foods for house plants may be secured from dealers put up in

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packages and ready for application. These packages usually contain full directions for their use.

LIQUID FERTILIZERS FROM NATURAL MANURES

Where a number of plants are grown, a liquid fertilizer made from natural manures may be used. This is prepared by placing in a barrel (45 gallons capacity) about one-half bushel of fresh cow-dung and about two quarts of hen manure. If the hen manure can not be secured the cow-dung may be used alone. Add water until the barrel is about one-half full and stir thoroughly. Allow it to stand and ferment for several days or until the manure has risen to the top. Now stir thoroughly again, fill with water and allow it to settle. The clear liquid may then be dipped off and is ready for use. When the clear liquid is all used add about one-third the amount of manure and brew again.

If the plants have been without fertilizer for some time, apply once a week for two weeks and then once every two or three weeks as required.

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CAUTIONS

A few cautions should be carefully observed. Never apply fertilizers too strong, as the effect is detrimental rather than beneficial. It is better to apply them in weaker solutions and to apply more frequently. A fertilizer should not be used with a dormant plant. In the case of such plants wait until the leaves are well started and then the plant can make use of the additional food.

CHAPTER VI

LIGHT, HEAT AND VENTILATION

LIGHT

Of all the factors that govern plant growth, light is one of the most important. A plant may be supplied with the proper soil, the requisite amount of moisture and the temperature best suited to its growth, yet unless it has the proper amount of light the results are likely to be unsatisfactory. The ability to secure the proper amount of light is necessary for the best development of the plant. Many flowering plants fail to bloom through lack of sunshine, and here, as well as with foliage plants, the growth becomes long and thin and the plant shows but a faint trace of its possibilities.

NECESSITY OF LIGHT

Light is absolutely necessary for the carrying on of the vital activities of all plants contain-

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ing green coloring matter, and in nearly all house plants the seat of this activity is in the leaves. The leaves, then, are organs for securing the proper light relation and the aim of the plant seems to be to place them in the position to secure the most light, or at least to secure the amount best suited for its development.

Where the light is cut off from the leaves they become functionless and as a result soon turn yellow and die. The ability to use raw food-materials and to convert them into true foods is lessened with the reduction of the amount of light and the parts of the plant which first suffer are the older and mature leaves. As the vitality of the plant is reduced, leaf after leaf drops and soon nothing is left but the stems and a few leaves at the top which are doing their best to live under the adverse conditions. The beauty of the plant is gone.

EFFORTS TO SECURE LIGHT

The movement of the leaves, then, is toward the light, and, when a plant stands continually in one position and receives the light from one

Fig. 16. The Boston fern

side only, the leaves turn toward the window, with the result that the plant becomes one-sided and unsymmetrical. This reaching toward the light is brought about in two ways: first by an elongation of the petioles or leaf-stalks, followed by a bending or twisting towards the source of light; and second, by the elongation of the stem and its bending toward the window. This reaching toward the light can only take place in the young leaves and stems which have not as yet become fixed. The mature leaves on the side away from the window, being unable to accommodate themselves to the new conditions, soon turn yellow and die and the side of the plant toward the room assumes a bare and unattractive appearance.

To overcome this the plants must receive light from all sides. Where light can only be secured from one side, as in the window, this may be accomplished by turning the plant every few days and exposing a different part to the light. This checks the tendency to grow toward any one side and results in a well-developed, symmetrical plant.

LIGHT, HEAT AND VENTILATION

AMOUNT OF LIGHT NECESSARY

The proper amount of light for a plant is that which gives it its best development. This amount is not the same for all plants, but varies with different kinds. Plants, such as the ferns, which in their wild state are found growing on the forest floor where they are protected from the hot sun by the over-arching branches of the trees, naturally require less sunshine than those whose home is in the open meadow. With this fact in mind, it is evident that the requirements of the plants to be used in a window garden should be studied that they may be given the proper light conditions.

The effect of a deficiency of light is very noticeable in plants that have been stored in the cellar over winter. When the cellar is warm they often begin to grow with the result that the stems are long, thin and soft and the leaves are small, yellow, and with long leaf-stalks.

SELECTION GOVERNED BY LIGHT

In securing plants for the window it is well to keep these points in mind and to select only

Fig. 17. Sun-loving and shade-loving plants arranged in the same window

LIGHT, HEAT AND VENTILATION

such forms as are suitable for the particular exposure. Often sun-loving and shade-loving plants may be arranged in the same window, by placing those requiring sunshine in the center and the others at the side. (Fig. 17.)

Where the window is a south or west one, with full exposure to the sun, blooming plants, as a rule, will do well. On the other hand, if the window is a north or east one, the best results are secured with foliage plants. This, however, does not exclude flowering plants from the east, or foliage plants from the south and west windows.

TEMPERATURE

Although most plants suitable for house culture may be grown in a temperature of from 60 to 70 degrees F., yet every plant has a definite range of temperature in which it makes its best growth. This range of temperature, however, is not limited by the maximum and minimum at which the plant will grow. When the temperature is above this optimum range the plant often becomes drawn, due to the forced growth; when below it, it becomes stunted.

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In nature there is a marked difference between the day and night temperatures. If this condition can be brought about in the dwelling it results in much good to the plants. During the daytime most of the energy goes into the production of food-stuffs to be used in the building up of plant tissues. At night this food-material is used by the plant in the building up of new tissue and during this period of greater growth a lower temperature is beneficial rather than detrimental.

Where a day temperature is maintained at from 60 to 70 degrees, the night temperature may be from 10 to 15 degrees lower. It is hardly surprising that many plants fail to do well in a modern steam-heated dwelling where the temperature is maintained at from 75 to 80 degrees day and night—a temperature which is ruinous to human as well as to plant life.

SELECTION GOVERNED BY TEMPERATURE

Plants should be selected, then, with reference to the temperature of the room in which they are to be kept. Some plants do well in a warm

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living-room, while others require a cooler situation for their best development.

Most dormant plants and those making little growth during the winter may be kept much cooler than the ordinary flowering plants.

The plants should not be exposed to the cold, wet rains of late fall and early spring. If this is done and the leaves of the plants turn yellow and drop there is little need to ask "What is the matter with my plants?" If they need a washing, place them in the sink or bath-tub and spray them. It is true that this takes more time, but it is vastly more beneficial to the plants.

VENTILATION

Give the plants fresh air daily, for it is just as necessary to plant life as it is to human life. In cold weather open the door or window farthest removed from the plants and allow the fresh, cool air to mingle with the warm. On pleasant days nearer windows may be opened for a time. Cool, fresh air will not injure the plants unless they are exposed to its action for too long a period.

CHAPTER VII

INSECT ENEMIES

Most plants have insect enemies and unless carefully guarded may be badly injured, if not entirely ruined by them. It is in this particular that the watchful eye is necessary if success in plant culture is attained. The plants should be examined from time to time for the presence of insects, and if any have made their appearance, they should be promptly exterminated. These insect enemies breed so rapidly that in a few days the entire plant may be covered with them. It will be found much easier to brush off a scale insect or two from time to time than to wait until the plant is covered and then attempt their destruction.

DESTRUCTION DEPENDENT UPON HABITS

In order intelligently to combat these insect pests something must be known of their habits

INSECT ENEMIES

and of the methods used for their destruction. The application of Paris green for the destruction of aphides or plant-lice is useless. If it is true that Paris green is a poison when taken in-

Fig. 18. The tip of a fuchsia branch ruined by the mealy-bug

ternally, why is it that it does not affect the aphids when it is destructive to the potato beetle? This is easily explained by observing the difference between these forms in the methods of feeding.

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KINDS OF INSECTS

All insects attacking house and garden plants may be divided into two general groups, according to their manner of feeding—namely, biting insects and sucking insects. In the first group the insect in feeding devours the tissues of the plant and incidentally any poison that has been applied to the surface. The poisons mostly used for this group are Paris green and hellebore.

In the second group the insects secure their nourishment by sucking the fluids from the inner tissues of the plant, so that poison applied to the surface is ineffective. Insects of this type must be exterminated by some substance which is poisonous when breathed or which kills when brought into contact with the insect. Tobacco in some of its forms is usually used for this purpose.

THE ENEMIES OF HOUSE PLANTS

There are four insects which are liable to become troublesome in the window garden—the plant-louse, scale, mealy-bug and red spider.

INSECT ENEMIES

PLANT-LICE

The plant-lice or aphides are perhaps the most common of the insect enemies found on house plants. (Fig. 19.) There are numerous forms

Fig. 19. Plant-lice greatly magnified

of these, two of which are of frequent occurrence, one being black and the other green. The black form is seldom found except on chrysan-

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themums and kindred plants. The green form is by far the more common and occurs on almost all plants except those which are densely covered with trichomes or hairs.

Plant-lice usually make their appearance on the young and tender growth of the plant. If left undisturbed the tender tips are soon covered with them, the growth is checked and the plant is finally ruined. As these are sucking insects the substance applied must be one that will be poisonous when breathed or by contact. In greenhouses where fumigation is possible, tobacco fumes give the best results. This, however, would be a very disagreeable remedy for the window garden and tobacco in other forms may be used. The simplest method is to spray the plants with an atomizer and then dust with freshly powdered tobacco. The powdered tobacco should be left on the plants for several days, or until the lice have disappeared, and then removed by spraying.

The best method is to spray with a solution of nicotine. Although nicotine is quite expensive, it is so efficient that only a small quantity is

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necessary. This should be dissolved in water, using the proportions indicated by the directions accompanying the preparation. Apply in a fine spray by means of a syringe or atomizer.

THE SCALE

The scale insects are most commonly found on the foliage plants and are usually most abundant

Fig. 20. Scales on a palm leaf highly magnified

on the palms, pandani and the ferns. There are numerous kinds, but those found on house

plants belong mostly to the genus *Lecanum*. All are of a brownish color and resemble miniature turtle-shells fastened on the leaves. (Fig. 20.) The numerous fruiting bodies on the under side of fern leaves should not be mistaken for scales, as is often done.

Where the leaves are smooth and flat, the scales are best removed by rubbing them off with a piece of coarse cloth or a sponge. Where the leaf surface is uneven, they may be removed by means of a tooth-brush. Care must be exercised in this operation to avoid injury to the leaves by bruising.

THE MEALY-BUG

The mealy-bug usually occurs in the axils of the leaves, on the growing tip, in the flower-clusters, or along the veins on the under side of the leaves. (Fig. 21.) It is white in color and is easily distinguished from other insects by its mealy or waxy covering.

Mealy-bugs are best removed from the plant by means of a brush, following the treatment by syringing, where possible. When once de-

INSECT ENEMIES

Fig. 21. The mealy-bug greatly magnified

stroyed, the plants should be syringed occasionally to prevent their possible reappearance.

THE RED SPIDER

The red spider is perhaps the worst enemy of house and conservatory plants as it is not likely to be noticed until the plants are covered with it.

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When the red spiders have once obtained a foothold it is difficult to dislodge them. The dry atmosphere of the living-room is ideal for their development.

These insects are so small that they are seldom noticed until the entire plant becomes infested. Where they are present the leaves lose their green color and become dotted with very small white spots. If the leaf is closely examined, it will be found to be covered with minute insects of a reddish color. When allowed to remain undisturbed they soon cover the plant with a fine web that glistens in the sunlight. Syringing with clear water is the best remedy. Where they have secured a firm foothold the plants should be syringed daily.

THE EARTHWORM

The best method to remove earthworms from pots, is to saturate the soil with a concentrated solution of lime-water. This is easily prepared by slaking a piece of lime in a pail of water. Allow it to stand for a short time until clear and then pour off the liquid and apply. Enough

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should be applied to saturate the soil thoroughly; a second application may be given if necessary.

There is no danger of making the solution too strong as water will only take up a definite amount of lime.

CHAPTER VIII

PROPAGATION BY SEED

Plants may be propagated by several methods, the most important of which are by seed, cuttings, grafting and layering. Of these various methods those which may be used with any degree of success in the dwelling are seeds and cuttings.

SELECTION OF SEED

The first requirement in raising plants from seed is to secure good seed. The seeds should be purchased from a reliable firm so that there is a certainty of securing seeds which are fresh. In making a selection choose only the best varieties. In these days of intense plant-breeding there is no excuse for inferior varieties when the market is full of better ones. It is also well to remember that the cheapest seed is rarely the best; that the best is always the cheapest in the end.

PROPAGATION BY SEED

Care should be taken to secure fresh seed, as many kinds fail to germinate well after the first year.

CAUSE OF FAILURES

Nearly all failures in growing seedlings arise from one of two causes—from poor seeds or from too deep planting. Complaints are often made that the seeds are of poor vitality when the real cause of failure lies in the planting.

VESSELS FOR THE SOWING OF SEED

For the growing of seedlings in the house several types of vessels may be used. The best of these is the seed-pan made of unglazed earthen ware. These seed pans are made with a depth of from 3 to 4 inches and in diameter ranging from 6 to 12 inches. The low form in Fig. 1 represents a pan of this kind.

SEED-BOXES; THEIR CONSTRUCTION

Where regular seed-pans are not to be secured, boxes may be used and serve just as well. Seed-boxes are easily made of $\frac{3}{8}$ or $\frac{1}{2}$ inch lumber and with care should last several years. They

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should be made not over three inches deep and of any convenient size. Fig. 22 shows a seed-box with outside measurements of 9 by 12 inches, which makes a very convenient size for the

Fig. 22. A seed-box, showing the effect of old seed mixed with fresh

window as it is nicely covered with a 10 by 12 inch pane of glass. Two or three holes in the bottom will provide for drainage in the seed-box.

SOIL AND ITS PREPARATION

A good soil for seed-boxes may be prepared by mixing one part fine leaf-mold with two parts of good garden soil. Great care should be taken to

PROPAGATION BY SEED

secure garden soil free from manure and other decaying vegetable matter. Where these are present they are liable to induce the growth of "damping off" fungi.

Where leaf-mold can not be secured the soil should be made more porous by the addition of sand. The addition of leaf-mold or sand makes the soil more open and porous thus preventing "caking" in drying out.

The soil should be pulverized and thoroughly mixed, all coarse pieces and stones being thrown out. It may be made of a more even texture by passing through a sieve with a one-fourth or one-half inch mesh. The box or pot should be filled with the prepared soil to within a quarter or a half inch of the top, and then, by means of a flat object, such as a brick or a block, the soil should be pressed down evenly and firmly but not too compactly. When properly packed a pressure of the finger should leave a slight dent in the soil.

WATERING OF SOIL

If the seeds to be sown are small ones the soil should first be thoroughly watered. This may

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be done in either one of two ways. If a watering-pot with a fine rose be at hand, the soil may be watered from above, and water enough should be applied to soak to the bottom. The other method is to set the box in a pan of water. The water in this case enters slowly through the openings in the bottom and thoroughly saturates the soil. The box should be left in the pan until the surface of the soil shows that the water is almost to the top. After removing the box from the pan it should be allowed to stand for five or ten minutes in order that the soil may become evenly saturated. It is then ready for the seed.

PLANTING OF THE SEED

If the seed be very small, as in the petunia or some of the primulas, scatter evenly over the soil and do not cover. Coarser seed, such as that of the pansy, should be scattered evenly over the surface and then lightly covered with soil. This covering of soil may be evenly and easily applied by shaking it through a flour sieve. Care should be taken not to cover too deeply, as the seed may not germinate or the seedlings

PROPAGATION BY SEED

may die because they are unable to push their way through the soil. The rule of the old gardeners is to plant twice the depth of the seed and it is well worth remembering. Very coarse seed should be pressed lightly into the soil before covering.

CARE AFTER PLANTING

After planting, the pot or box should be covered with a pane of glass to prevent excessive evaporation and placed in a north or east window until the seedlings make their appearance. When the seedlings are up the box should be removed to a light window to prevent the plants from becoming long and weak. Where it is not convenient to place in a north or east window, set the box in a south or west one and cover the glass with paper to exclude the light. When the seedlings have made their appearance the paper should be removed to prevent the plants from becoming drawn.

The soil in the seed-box should not be allowed to become dry, as the germinating seeds and the young seedlings are easily injured by a lack of

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moisture. Water by setting the box in a pan of water as described above.

The glass should be removed from the box for ten or fifteen minutes each day to allow fresh

Fig. 23. A primrose raised from seed

air to come in contact with the soil. After the seedlings are up and well established the glass should be removed entirely so as to induce a stocky growth.

PROPAGATION BY SEED

DISEASES OF SEEDLINGS

One of the worst diseases of young seedlings is caused by the "damping off fungus." Where this makes its appearance the plants rot off just above the soil. To hold this fungus in check, dust with sulphur. This may be done by placing a little sulphur in a piece of cheese-cloth and gently shaking it over the diseased plants.

POTTING OF SEEDLINGS

When the seedlings have formed two or three leaves and are large enough to handle they may be planted in small pots or in other boxes, using the same kind of soil as in the seed-box.

PLANTING IN POTS

Where pots are used, the planting is done in the following manner. Fill the pot with soil and thrust the forefinger into it well to one side of the pot. Now using the middle finger and thumb as levers force the forefinger toward the center. This packs the soil toward one side of the pot and leaves a hole with its edge just in the

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center of the pot. With the left hand, take the plant by the leaves and place it in position with the roots against the side of the hole at the center of the pot. While still holding the plant in position, fill the opening with soil and press down firmly with the forefinger. This packs the soil firmly about the roots. Complete the operation by adding more soil and "firming" it with the thumbs as in Fig. 8.

PLANTING IN BOXES

If boxes are used they should be of the same height as those in which the seed was sown. Fill with soil in the same manner as seed-boxes, but do not water before planting. Planting is in this case best done by using a case knife. A hole is made by plunging the knife into the soil and then forcing it to one side. The plant may then be placed in the opening and the soil pushed back again with the flat side of the knife.

After potting water thoroughly and protect from the sun until the plants have become well established.

CHAPTER IX

PROPAGATION BY CUTTINGS

The most satisfactory methods of propagating many plants is by means of cuttings or slips. A cutting is a part of a plant which has been severed from the parent stalk and which on being planted under proper conditions will root and become an independent plant.

ADVANTAGES OF CUTTINGS

Where a plant lends itself to this method of propagation great advantages are gained. Plants raised from cuttings usually bloom sooner than those raised from seeds, and are always sure to resemble closely the parent. Plants grown from cuttings also attain a greater size in any given period of time than plants grown from seed. (Fig. 24.)

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Fig. 24. Four months old geranium from a cutting

KINDS OF CUTTINGS

Cuttings are of three kinds, according to the part of the plant from which they are taken, namely: stem-, leaf-, and root-cuttings.

The stem-cutting is the most common form and is a portion of the stem; it may or may not bear leaves. Leaf-cuttings may be made either from entire leaves or from parts of leaves. The leaf-cutting can only be used in the case of certain plants with more or less succulent leaves, such as the begonia. Root-cuttings are selected portions of roots which on being properly

PROPAGATION BY CUTTINGS

planted form buds which develop into new plants. This method is only available for use with plants which sucker freely from the roots.

SELECTION OF CUTTINGS

All stem- or leaf-cuttings when placed in the soil form a callus over the lower or cut end from which the new roots develop. Where stem-cuttings are to be made, select a growing tip, using care to choose one in which the wood is beginning to harden but is by no means mature. Cuttings of geraniums, coleus, and such soft plants may be made of the soft growing tip, but such cuttings under ordinary house conditions are liable to decay instead of taking root. It is best for use under house conditions to take a cutting which has some well developed wood at the base.

PREPARATION OF CUTTINGS

The cutting, before it is ready for the propagating-box, should be trimmed (Fig. 25) with a sharp knife through the joint or just below it. Many plants will root at any point along the

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stem while others will only root at the joints; to be on the safe side, therefore, it is better to cut at the joint or just below it.

The lower leaves should be removed with a knife so as to give a free stem of at least three-

Fig. 25. Selection and preparation of a cutting

fourths of an inch for insertion in the soil. The area of the remaining leaves should be reduced about one-half by cutting away a part of each leaf-blade. The object of this is to lessen the transpiring surface and so prevent excessive

PROPAGATION BY CUTTINGS

transpiration. This reduction in leaf also permits the cuttings to be placed more closely in the propagating-box. (Fig. 27.)

Fig. 26. Protection against loss of moisture

PROPAGATING-BOXES

Where a number of cuttings are to be rooted, it is best to prepare a propagating-box. (Fig. 27.) A simple form may be made with very little trouble. A box, six or seven inches deep and of any convenient size and a pane of glass large enough to cover the box is all that is re-

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quired for this work. The glass prevents excessive evaporation and protects the cuttings from all drafts. Where the box is thus covered the contained air remains moist and checks the

Fig. 27. An inexpensive propagating-box

drain on the leaves. It is also much easier to control the moisture conditions of the soil. In the propagating-box, as in the seed-box, several holes should be bored in the bottom to secure proper drainage. Flat pots or low boxes may

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also be used, provided they are covered with some kind of glass hood or bell-jar.

Where but few cuttings are to be rooted, they may be planted separately in small pots and protected from excessive transpiration by inverting tumblers or fruit-jars over them. (Fig. 26.)

THE SOIL

The best soil for propagating purposes is a clean sifted sand for cutting-boxes and a light sandy loam for pots. The loam used should be *free from manures* of all kinds.

FILLING OF BOXES

To prepare the cutting-box, place in the bottom about three inches of clean sifted sand and level it off. Water it thoroughly and then, by means of a brick or a block of wood, pack the sand firmly. It is then ready for the cuttings.

INSERTION OF CUTTINGS

Plant the cuttings by making a groove about three-fourths of an inch deep in the sand, using a case-knife for the purpose. Place the cut-

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tings in this groove, allowing enough space between them to give all of the leaves the advantage of the light. Where the cuttings are placed too close together, the lower leaves turn yellow and often rot. When the row across the box is filled, press the sand down firmly against the stems; then make another groove and fill as before. Care should be taken to have the bases of the cuttings well down in the groove and resting upon a firm bottom.

CARE OF CUTTINGS

When the cuttings are all placed, they should be watered thoroughly. This helps to pack the sand down closely against the stems and thus prevents their drying out. The box should be covered with the pane of glass and set in a window where it may receive plenty of light but no direct sunshine. The sand should be kept constantly moist but not allowed to become water-soaked.

The glass should be removed from the box for a short time each day, to renew the air. When the cuttings are beginning to root, ventilation

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may be provided by placing a small block under one side of the glass.

When the cuttings are well rooted they should be removed from the sand with a case-knife and potted in small pots. (See Chapter II.)

CHAPTER X

BULBS

USES OF BULBOUS PLANTS

Among the plants suitable for window gardening are to be found many kinds of bulbs. When correctly treated, no class of plants gives greater satisfaction and none may be more safely depended upon for a definite supply of bright and fragrant blooms.

Many of these forms require no space in the window except during the time of flowering. When the blooming season is over they may be removed and the space given to others which have been held in reserve. In this way a constant succession of flowers may be maintained from December to April.

KINDS FOR FORCING

The best kinds for winter forcing are the early spring flowering forms of hardy bulbs,

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which are easily grown and require a very short period to bring them into full flower. In addition to these some of the lilies may be grown to a good advantage.

SELECTION OF BULBS

In selecting bulbs care should be taken to secure none but the best. In all bulbs which

Fig. 28. What a first size hyacinth bulb will do

bloom in the early spring, the buds, which are to produce the flowers, are formed during the

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previous season's growth and are stored in the mature bulb awaiting the proper conditions for further development. The selection of cheap or small bulbs, therefore, necessarily means

Fig. 29. Murillo, the queen of tulips

small flowers or flower clusters. For example, a small hyacinth bulb, even with the best of care, will only produce ten flowers to the cluster if there were only ten buds folded in the bulb. If

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large flowers are desired secure only large and well-developed bulbs. (Figs. 28 and 29.) The smaller bulbs may be reserved for garden planting.

THE SOIL

The best soil for bulbs is a fairly rich sandy or light loam. A great excess of fertilizer is not required by most bulbs in forcing as the food necessary for the full development of the flowers is largely stored in the bulb itself. If manure is required, only such as is in a thoroughly rotted state should be used. *Never use fresh manure of any kind.*

DEPTH OF PLANTING

The depth to which bulbs should be potted depends entirely upon the kind. Hyacinths, narcissi, tulips and similar bulbs should be planted so that the tip is just below the surface of the soil. It is unnecessary to plant them any deeper as the roots are all formed from the under side of the bulb. In lilies, however, the root formation is different. Here the roots are formed on the stem above the bulb as well as

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from below. The bulb therefore, must be planted much deeper in the soil to allow for the proper development of these upper roots.

The best way to secure this depth, in potting lilies, is to follow the same method of shallow planting as with hyacinths, but to have the pot only one-half to two-thirds full of earth when the operation is completed. As the lily begins to grow and the stem elongates, the pot should be gradually filled with fresh soil.

POTTING OF BULBS

The operation of potting a bulb is similar to that used in potting any other plant. Cover the opening in the bottom of the container with a piece of broken pot and then partly fill with soil. Press this down firmly with the fingers and place the bulb in position; then fill the pot with soil and press down thoroughly, using the fingers only.

The bulb should never be pressed into the soil in order to get it down deep enough. Where the soil is moist such pressure packs the earth so

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firmly under the bulb that the roots can not penetrate it and the bulb is lifted out of the soil by the root growth. (Fig. 11.) If the bulb does not set deep enough take it from the pot and re-set after having removed some of the soil.

NUMBER OF BULBS TO POT

Bulbs for the window garden may be grown either singly or in masses. With many forms it is best to plant at least three or four in a pot. Where more than one bulb is used, all should be of one variety or of varieties requiring the same length of time for development. Where early and late varieties are used in the same pot, the growth is uneven and the early forms may be gone before the late ones are half grown. Fig. 29 shows tulips massed in a six-inch pot.

Either standard or azalea pots may be used for the larger bulbs and seed- or bulb-pans for the smaller ones.

STORAGE OF BULBS; CELLAR

After having potted the bulbs, they should be watered thoroughly and stored in a cool, dark

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and airy place until time for blooming. The best place to store bulbs is in a cool, unused cellar. The temperature may go down to 32 or even 30 degrees F. without injury while the leaves are undeveloped.

During this time the bulb will be forming its roots and should be examined from time to time to see that the soil does not become too dry. When dry it should be watered with cold water. During the period of storage the soil should be kept moist but not wet. When too dry, the roots can not develop and growth becomes stunted. When kept too wet the bulbs are likely to rot.

STORAGE IN GARDEN

Where a cool cellar is not available, the pots may be stored in the following manner. Dig a trench about a foot deep in a sheltered position in the garden or yard and place in the bottom about three or four inches of coal ashes or gravel to secure good drainage. Set the pots on the ashes and fill in around them with soil; heap the remaining soil over them and round off the

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surface so that it will shed water. This method furnishes ideal conditions for root action. When cold weather sets in, cover with four to six inches of rough stable-manure to prevent the frost from penetrating to the pots and thus provide for their safe removal at any time during the winter.

Half hardy and tender bulbs should receive a somewhat different treatment from that indicated above. They should at first be kept in a cool room and later removed to a warmer place for forcing.

TIME TO PLANT

Bulbs to be grown in the window garden may be secured from August to November. They should be planted as soon as secured. Some advocate the planting of successive lots to secure early and late flowers, but it is much better to plant all at the same time and then hold them back in storage. When bulbs are kept out of the soil for too long a time they are certain to lose vitality.

WHEN TO FORCE BULBS

No attempt should be made to force bulbs until they are thoroughly rooted. This will require from three to eight weeks, according to the kind of bulb. Where bulbs are forced before the roots are thoroughly developed, the leaves remain short and the flowers either dry up or are imperfectly developed. Most bulbs should not be brought up to the warmth and light until the latter part of January. As the regular blooming season approaches the time required for forcing decreases and the development becomes more perfect.

Bulbs, after having once been forced, may be stored in a light cellar or if it is late in the season set outside and allowed to ripen off. These bulbs may be used for planting in the garden in the following fall.

Bulbs should not be used a second time for forcing as they have lost a large part of their vitality. Further, if they have already attained their maximum size they break up into several inferior bulbs.

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KINDS FOR FORCING

Among the many varieties of bulbs suitable for forcing the following are considered as some of the best.

THE HYACINTH

Hyacinths are of two kinds, known to the trade as the Roman and Dutch types. The Roman hyacinth is a small flowered form which produces several sprays to the bulb, and by planting early may be brought into bloom by Christmas. The Dutch hyacinth is the large flowered form and usually has but a single large cluster to the bulb. To secure the best results these should not be forced until February. Fig. 28 shows the possibilities of a first or largest size bulb of Dutch hyacinth. This variety usually produces several clusters to the plant and is very attractive.

Bulbs of the Roman hyacinths may be planted three to five in a five-inch pot. The Dutch hyacinth of the first size should be planted singly in five-inch pots. Smaller bulbs should be

planted singly in four-inch or three to six in a six-inch pot.

Hyacinths may also be flowered in water in special receptacles known as hyacinth glasses. These may be bought from the florist or seedsman. Fill the inner receptacle with water and place the bulb in position. The water should just reach to the bottom of the bulb. It should then be set in a dark, cold place, but not where there is danger of freezing, as freezing will break the glass.

When well rooted the pot should be placed in a sunny window and the glass filled with water whenever necessary.

For water culture select sound bulbs of the single Dutch varieties.

Roman hyacinths with pink, blue or white flowers are easily obtained from florists. Dutch hyacinths in both single and double forms may be secured in the various shades of pink, blue, white and yellow. The single varieties, however, are to be preferred, as the trusses are much larger.

THE TULIP

Tulips are always satisfactory if given plenty of time for root formation. (Fig. 29.) When an attempt is made to force tulips too early the stems and leaves remain very short and the flowers are very small, even blighting in extreme cases. The best time to force tulips is from February to April.

To obtain the most striking effects, tulips should be planted thickly, at least three bulbs in a five-inch pot, or six bulbs in a six-inch pot.

In selecting tulips for forcing it is best to choose the named varieties, such as the florists use. Select only the early single and double forms, leaving the late varieties for outdoor culture. Among these some of the best are: Single—La Reine, white; Vermilion Brilliant and Colour de Cardinal, scarlet; Yellow Prince of Orange and Mon Tresor, yellow; Rose luisante, pink; Keizerskroon, red and yellow; double Murillo (Fig. 29.) pink; Le Matador, scarlet; Courronne d'or, yellow.

THE NARCISSUS

With the exception of a variety or two, which may be brought into bloom during December, the narcissi should be reserved for February and March forcing. From one to six bulbs, according to size, should be planted in a five-inch pot to obtain the most effective results.

From the narcissi may be selected a number of varieties suitable for forcing. (Fig. 30.) The earliest of these is the "paper white" (*N. tazetta alba*) of the polyanthus group. This form if planted early may be brought into bloom with the Roman hyacinth in December.

Of the daffodils or trumpet *Narcissus* group, some of the best single varieties are, Golden Spur, yellow; Princeps Ajax, yellow crown and cream colored segments; Bicolor Empress, yellow crown and white segments; of the double varieties the Double Von Sion is the best.

Mrs. Langtry is a short-crowned white narcissus, suitable for forcing. *N. poeticus ornatus* is an early form of the poet's narcissus suitable for late forcing.

Fig. 30. The Narcissus

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The Chinese sacred lily makes an interesting house-plant, as it may be easily grown in water. Fill a bowl about six inches in diameter and three to four inches deep, half full of clean pebbles and set the bulb upon them. The pebbles are merely to keep the bulb in position. Then fill the bowl with water to the height of the base of the bulb. If too much water is given there is danger of the bulb rotting. It should then be set in a cool, dark place until the roots are well developed, when it is ready to be placed in the window for forcing.

THE LILY-OF-THE-VALLEY

No attempt should be made to force the lily-of-the-valley until March and April, as it requires a great deal of heat. As the natural season for blooming approaches it may be forced more readily and surely. Much better success will be obtained if the rhizomes have been frozen before forcing.

Plant from eight to twelve pips in a five-inch pot, in light, sandy loam. Water well and set in a warm moisture, as moisture and heat are all

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that is necessary to bring them quickly into flower.

Use only strong blooming pips such as may be secured from the florist during the winter months.

THE FREESIA

Freesias are the most satisfactory of the tender bulbs for the window garden. The length of their blooming season, together with their delicate fragrance, make them great favorites.

Plant from eight to ten bulbs in a five-inch pot and place at once in the window. If the plants become tall and unwieldy, place a small stick in the center of the pot and tie the stalks to it.

Freesia bulbs if properly ripened and dried off may be used the following year for forcing.

THE LILIES

Of the many kinds of lilies the one best suited for house culture is the Easter lily or *L. longiflorum* and its varieties. (Fig. 31.) They should be potted in September or October in five-inch or six-inch pots, according to the size

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Fig. 31. The Easter lily

of the bulbs. Place in the window of a cool room until the plant begins to make a good growth, then remove to a warmer window. Like the hyacinth it produces little top growth until the roots are formed.

CHAPTER XI

FOLIAGE PLANTS

There are many forms of foliage plants suitable for house culture which, although they produce no bloom, are valued because they require so little sunlight. Many may be grown at some distance from the window and still give good results.

ASPARAGUS

The two forms of *Asparagus* best adapted to house culture are *A. plumosus nanus* and *A. sprengeri*. Each of these has characteristics peculiarly fitting it for a position in the window garden.

When given plenty of root space, *A. plumosus nanus* is a climber, but as a pot plant it remains dwarf until at least several years old. If any long shoots are produced, the symmetry of the plant may be preserved by pinching out the tips

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at the height of the remainder of the plant. If the long vines are desired, they can be trained upon a trellis or up the side of the window. Fig. 6 shows a plant of *plumosus nanus* from a four-inch pot.

Asparagus sprengeri (Fig. 32), on the other hand, is a trailing form and lends itself well to use in hanging baskets. When grown in a pot it may be placed upon a stand and the vines allowed to hang to the floor or the pot may be suspended in the window by means of pot-hangers. This form requires abundant light to prevent the vines from becoming long and thin.

Both should be potted in soil prepared according to formula No. 1. As the plants become pot-bound they should be shifted to larger pots.

All forms of *Asparagus* and especially *A. sprengeri* are voracious feeders and should be given occasional applications of some suitable fertilizer.

Water freely but do not keep the soil wet. The large fleshy roots are adapted for the storage of water so that the plant suffers little by an

Fig. 32. *Asparagus sprengeri*

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occasional drying out. It is this fact that makes it peculiarly suitable for a house plant.

ASPIDISTRA

The aspidistra makes an ideal plant where one of low growth is desired as it can stand more

Fig. 33. The Aspidistra

heat, dust and gas than any other house plant. An aspidistra will often do well where other plants fail. They may be secured either with

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plain green leaves or with leaves variegated with white. (Fig. 33.)

For potting use soil prepared according to formula No. 1 and keep in a good growing condition.

Give plenty of water at all times, but avoid over-watering.

Young plants are started from divisions of an old one. When plants become too large they may be cut into from two to four pieces and potted separately.

ARAUCARIA

Araucaria excelsa or Norfolk Island pine, as it is commonly called, is a charming plant for a light window in a cool room. This plant with its symmetrical growth belongs to the conifers and will stand, during the winter, a temperature as low as 55 or 50 degrees. When kept cool and given plenty of light it is the most satisfactory small tree available. During the summer it will do well on the outside or on the porch, but it should always be kept shaded. Exposure to the hot sun has a tendency to turn the leaves

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brown and give to the entire plant a yellowish-brown appearance.

A loam such as is described in formula No. 1 is a good soil for the araucaria but may be improved by the addition of a little leaf-mold.

The araucaria should be watered moderately and uniformly to secure the best results, but care should be taken not to over-water.

CYPERUS

The cyperus or umbrella plant is the only house plant which may be grown with the pot resting in water. Naturally a water plant, it requires an abundance of moisture. It also does well when treated as any other house plant, save that it should be watered more abundantly. Fig. 13 shows a young plant of *C. alternifolius* or the common umbrella plant. *C. papyrus* or the Egyptian paper-plant also belongs to this family, but does not make a good house plant.

A loam such as is given in formula No. 1 is an excellent soil for the cyperus.

Cyperus may be grown from divisions of the old plant, but the most symmetrical plants are

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raised from seed which should be sown in the spring.

FERNS

The fern is to-day rapidly superseding the palm as a house plant. The rapidity of its growth combined with its easy culture tend to make it a great favorite.

The best ferns for house culture are those of the sword-fern or *Nephrolepis* group. The florists offer numerous attractive forms which easily withstand the dry atmosphere of the living-room. The first variety of the new class of *Nephrolepis* to be offered was the Boston fern (*N. exaltata bostoniensis*.) This form has entirely replaced the old, erect *N. cordata* or sword-fern. The fronds of the Boston fern often attain a length of four to six feet and drooping over the edge of the pot give to the plant a very graceful and attractive appearance. (Fig. 16.)

The Scott fern (*N. scotti*) is a form of *bostoniensis* with shorter leaves and more compact growth. It is found very useful where a more erect form is desired.

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The Pierson fern (*N. piersoni*) is as easily grown as the Boston but has much broader and heavier leaves. The pinnæ or leaflets instead

Fig. 34. The Pierson fern

of being simple, as in the Boston fern, are again divided. (Fig. 34.)

Among the newer varieties are the Tarrytown

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fern (*N. piersoni elegantissima*) and Barrow's fern (*N. barrowsii*). Both are dwarf forms of the Pierson fern but have broader and heavier leaves.

Ferns prefer a good fibrous loam, and the potting soil should be prepared according to formula No. 2. The plants should be kept in a good growing condition and should be shifted whenever necessary.

The best results are obtained with ferns when they are not exposed to the direct rays of the sun. Too much sunshine has a tendency to check the growth and to turn the leaves yellow.

The soil should be kept moist but not wet. An excess of water as well as a lack of it and exposure to too much cold will cause the leaves to turn yellow and fall.

Ferns of this type are best propagated by removing the small plants formed on the runners and planting them in small pots. They may also be propagated by divisions of the old plant, but this method is not so satisfactory.

Ferns for the fernery should be secured from two or two and one-half inch pots, according

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to the size of the dish in which they are to be planted. Only the hardier species, which are able to withstand the dry atmosphere, should be selected for this purpose.

In Fig. 35 are shown six varieties of ferns for the fernery. They are, from left to right, *Aspidium tsussumense*, *Adiantum capillus-*

Fig. 35. Ferns suitable for the fernery

veneris, *Pteris tremula*, *Pteris serrulata*, *Cyrtomium falcatum* and *Pteris cretica albo-lineata*. In addition to these the following are also good:—*Cyrtomium fortunei*, *Onycium japonicum*, *Nephrolepis duffi* and the following species of *Pteris*, *ouvrardi*, *serrulata cristata*, and *cretica magnifica*.

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GREVILLEA

Grevillea robusta or silk oak comes to us from Australia. It makes a desirable house plant, as it is able to stand much handling and neglect. (Fig. 36.) In warm countries where it can be grown outside it becomes a large tree and is planted for shade purposes.

Propagation is by means of seed which should be sown in the spring. To secure bushy plants the seedlings should be pinched back when 18 to 20 inches high in order to force them to branch.

Soil for potting should be prepared according to formula No. 1. Keep in a good growing condition and water when required.

PALMS

Of the numerous varieties of palms offered on the market there are many which are adapted to house culture. Among the best, perhaps, are two forms of *Kentias*, namely *K. belmoreana* and *K. fosteriana*. Of these *K. belmoreana* is the smaller and the greater favorite. (Fig. 37.)

Fig. 36. *Grevillea robusta*

Fig. 37. *Kentia belmoreana* as a house plant

Areca lutescens has narrower leaflets than the *Kentias* and the leaves are also more erect. The *Arecas* also branch near the base, thus giving rise to numerous stalks which make the plants more bushy.

The *Latania borbonica*, or fan palm, is also easily grown. *Livingstonia rotundifolia*, a palm with leaves similar to those of the fan palm but of a more compact and graceful habit,

is also considered one of the most desirable and suitable forms.

To the above may be added two members of the date palm group: *Phoenix rupicola* and *Phoenix canariensis*. The latter is the gem of the group. (Fig 5.)

A rather heavy soil such as indicated by formula No. 3 is best for palms. Do not repot too often but keep the root-system somewhat restricted and maintain a good growing condition by an occasional application of liquid fertilizer or manure. If the plant has been lifted out of the pot by the growth of the roots shift to a larger pot. In shifting, some of this mass of roots at the bottom may be removed by tearing it loose with the fingers and then trimming with a knife. This will allow the plant to set more deeply in the pot.

Palms should never be exposed to the direct rays of the sun and therefore may be grown in almost any exposure. In the summer the palms may be removed from the house and set in the shaded part of the veranda or under a tree. Never set a palm that has been grown in the

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house in the hot sun as the leaves will burn and become brown.

Watch carefully for insects, as the palms are the homes of many scale forms. The leaves should be washed once or twice a month to remove the dust and to keep the insects in check.

PANDANUS

There are two forms of Pandanus that are desirable for the window garden. One is the variegated green and white form, known as *P. veitchii*, and the other a green form with a reddish tinge to the leaves, known as *P. utilis* or screw pine.

Care must be exercised in watering the Pandanus forms, as an over-abundance of moisture will rot them off at the surface. It is safer to keep them a little dry than to over-water.

They should be shifted when necessary, using soil prepared according to formula No. 1. If allowed to become pot-bound the large roots begin to raise the ball of earth from the pot.

The leaves should be kept free from dust by syringing or sponging.

RUBBERS

The rubber plant or *Ficus elastica* with its large leathery and shining leaves is well able to withstand the adverse conditions of the living-room. (Fig. 38.)

For potting soil use formula No. 1. The rubber plant should be shifted only when the pot becomes densely filled with roots. It is better to feed well than to shift it to too large a pot. Rubber trees, when too tall, may be cut back to any desired height. The cutting-back should be done in the spring when the weather is steadily becoming warmer, as it is in the summer months that the plants make their greatest growth. Fig. 38 shows a rubber between seven and eight feet tall which was cut back to three feet. After cutting back there was not a single leaf upon it. The photograph was taken about three months later. To secure low bushy plants, the young plants should be topped when from fifteen to twenty inches high.

Wash the leaves occasionally with clear water and keep the soil fairly moist.

Fig. 38. Rubber plant three months after cutting back

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It is better to purchase young rubber plants from the florist as they are very difficult to propagate.

TRADESCANTIA

The Tradescantia, or wandering jew, serves well as a basket or bracket plant where the stems have an opportunity to droop. (Fig. 3.) They will do well in shaded positions but require an abundance of water.

Soil prepared according to formula No. 1 will do well for them. The Tradescantia are best propagated by cuttings planted in pots of fresh soil.

CHAPTER XII

FLOWERING PLANTS

Where plenty of light can be secured, a great variety of flowering plants will do well in the living-room. The following list gives some of the more common and satisfactory forms.

AMARYLLIS

The Amaryllis, properly known as *Hippeastrum*, is one of the old-time favorites, requiring but little attention and always giving satisfaction.

The Amaryllis is grown from a bulb which, although not herbaceous, requires a period of rest during the winter. In the winter they should be watered sparingly. When growth begins in the spring and the buds begin to appear they will require more water. During the summer the plants may be set outside but should be regularly watered as during the blooming pe-

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riod. It is at this time that the plant is making its growth and storing up strength for future flowering.

Bulbs in seven or eight inch pots need not be repotted, but should have the top soil removed from time to time and replaced with fresh. A rather rich, heavy loam is most suitable for *Amaryllis*.

AZALEA

Azaleas which have been procured during the flowering season will, with the proper attention, bloom from year to year. After the plant has ceased flowering, pick off all the old flowers and remove to a cool room until the weather is warm enough to set the pot outside. When warm enough, place it under some tree or on the north side of the house, where it will have plenty of light but will not be exposed to the hot sun. To prevent the soil from drying out too rapidly, sink the pot up to the rim in the soil. Water when necessary and syringe occasionally to keep the foliage clean. One of the secrets in growing azaleas successfully lies in never allowing

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the soil to become dry. The pot is filled with a mass of very fine roots which are easily injured either by continual drying or by overwatering.

Fig. 39. The Azalea

When cold weather approaches, the azalea should be brought into the house and placed in a cool room, preferably one where there is no

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heat but where it does not freeze. Keep it in this condition during the winter, watering carefully. In late winter or early spring when the buds are beginning to swell it should be removed to a warmer room. If the plant is placed in a warm room when taken in from the yard, the buds, instead of opening, dry out and fall off. When through blooming, repeat the treatment outlined above.

Every year or two the plant should be shifted to a pot a size larger, using soil prepared according to formula No. 2. The spring is the best time to shift. Fig. 39 shows an azalea that has been treated as described.

BEGONIA

Many kinds of Begonias do well in rooms where the night temperature does not fall below 55 to 60 degrees. A lower temperature than this is injurious and causes them to loose their leaves.

There are two classes suitable for house culture: a shrubby section with many winter-flow-

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ering species, and a rex section grown merely for their ornamental leaves.

A light soil, such as is given in formula No. 2, with a little well-rotted manure added, answers well for all begonias.

Begonias may be placed on the outside during the summer but must be protected from the sun.

CALLA LILY

When given a window where it will receive plenty of light, the calla lily (*Richardia africana*) can be successfully brought into flower.

In selecting callas be very sure to secure strong tubers, as they invariably give the best results. Pot in the same manner as a hyacinth except setting in such a way that the tip will be slightly deeper in the soil. The soil used should be prepared according to formula No. 1.

Callas should be watered thoroughly after potting and then kept rather dry until the plants are well started. After they are well up they should receive an abundance of water.

The pots may be set outside until the weather

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begins to get cool but the plants should never be allowed to become frosted.

When growing luxuriantly an occasional application of fertilizer is highly beneficial, as they are gross feeders.

In removing the old flowers, care should be taken not to injure the leaf-stalk as two flowers are always produced from the same leaf. After the second flower is out the leaf may be removed.

In June, water should be gradually withheld and the tops allowed to die off. When the top is dead the pot should be laid on its side in a shed or some dry place where it is protected from the sun. In August knock the soil from the pot and remove the bulb. Remove all the small bulbs from the sides of the large one as they will not bloom and merely help to fill the pot. Plant again, using fresh soil and treating as described in a previous paragraph.

CACTUS

There are some kinds of cacti which make interesting and attractive house plants. As the

cacti are desert plants they should be given a sunny window and watered carefully and sparingly. During the growing season water moderately, using care not to over-water, as an excess of moisture will cause them to rot.

The soil best suited for the cacti is a light porous loam prepared by mixing two parts of fibrous loam with one part sand. In planting, fill the pot about one-fourth full of broken brick, charcoal or gravel to give good drainage. Use pots of ample size but do not make the error of using pots that are too large. Do not shift oftener than is absolutely necessary as cacti are better kept in the same pot for several years.

Most of the cacti are provided with numerous spines, but there are several interesting kinds which are without the spines. Among these latter is a flat-stemmed form, *Phyllocactus*, whose large white flowers open at night. Another spineless form is the *Epiphyllum*, or crab cactus, which produces a wealth of red flowers. Among the prickly cacti are many odd forms which are chiefly grown as curiosities.

CARNATIONS

Carnations may occasionally be grown in the window garden with some degree of success, but the majority of attempts end in failure because of unsuitable temperature and moisture conditions. Carnations are also especially subject to the attacks of the red spider.

When grown in the window, carnations should have plenty of sun and the temperature, in the daytime, should not go above 65 degrees but at night may go down to 50 degrees.

Carnations may be secured in all shades of pink, red, white, yellow, crimson and purple and in many variegations. Either secure small plants in the spring and plant in the garden during the summer or get field-grown plants in the fall.

If grown in the garden the plants should be lifted in the fall and planted in five or six inch pots and kept in a shaded place until well established. Carnations should be kept out of doors until just before the frosts.

CHRYSANTHEMUMS

Chrysanthemums when successfully grown make a welcome addition to the autumn flowers of the window garden. These should occupy the window only during the flowering season.

Only the dwarf varieties should be selected and preferably those which break into branching freely. Young plants should be procured in the spring. During the summer they should be grown in pots or in the garden.

When grown in pots, the plants should be shifted from the small pots into those four or five inches in diameter and placed out of doors fully exposed to the sun. Where possible it is best to sink the pots up to the rim in the soil in order to prevent the soil from drying out too rapidly. This also serves to keep the soil in the pots cooler. It is also well to put two or three inches of coal ashes under the pots in order to provide good drainage and to keep out worms. Shift into larger pots when necessary, using soil prepared according to formula No. 1. .

When grown in the garden, the plants should be set out so as to allow plenty of room for the season's growth. About the first of September the plants should be carefully lifted and potted. After potting, the plants should be kept in a shaded place until well established. The plants should be removed to the house when there is danger of frost.

When low bushy plants are desired the young plants should be topped when six or eight inches high and when the new growth becomes three or four inches long should be topped again. This treatment should be continued until the first of August to insure as much branching as possible. To secure large flowers, all the small buds should be removed, only one good bud being left upon the stem.

After blooming, the old plants may be stored in a light cellar during the winter but should not be allowed to dry out. In the spring they can be brought up and started into growth to provide cuttings for future use. The chrysanthemum is propagated in the same way as the geranium.

Fig. 40. The old and new forms of *Cyclamen persicum*

CYCLAMENS

The cyclamens make good plants for the house, as they bloom all winter. Although they may be raised from seed, the length of time necessary to grow a plant of blooming size makes it much cheaper and more desirable to secure the plants from a dealer. The cyclamens thrive best in a sunny window in a cool room.

The cyclamens commonly grown are *C. persicum* and its varieties. Great improvement has been made within the past few years in the size and coloring of the blooms. Fig. 40 shows the old *C. persicum* at the left and the new orchid-flowered cyclamen at the right.

Where it is desired to keep the bulbs for a second year's flowering they should be kept in a growing condition. In June or early July knock the plants from the pots, remove part of the soil and put the plants back in the same pot or one a size larger, using fresh soil prepared according to formula No. 2. In potting, at least one-half of the bulb should extend above the soil. Place in the shade of a tree or of the

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house, as they should be kept as cool as possible. The plants will make their best growth when cool weather sets in, but should be removed to the house in good season before there is any danger of frost.

FUCHSIAS

The fuchsias are old favorites among house plants and are desirable forms for spring and summer blooming. They thrive best when placed where they receive the morning sun but they should not be exposed to the hot sun of mid-day.

Fuchsias with double and single flowers are upon the market but for house culture the single varieties are the best as they are usually stronger growers.

For potting soil formula No. 1 should be used, or better still No. 1 plus one part leaf-mold. When the plants are making a good growth water freely and when in bud and flower, feed liberally with liquid manure or fertilizer. Fuchsias bloom most freely when not given too much root space. Plants in smaller pots and

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well rooted, will, if liberally fed and watered, give a wealth of flowers.

Young plants may be easily propagated by means of cuttings during the winter months and will bloom freely during the following summer.

Large plants may be carried over winter in a dry cellar, but should be kept rather dry though not allowed to shrivel. In the spring they should be brought out of the cellar and cut back to the well-ripened wood. When the plants are well started either repot or shift. When treated in this manner old fuchsias will give an abundance of bloom during the summer.

GERANIUM

Although the geranium is one of the most common, it is at the same time one of the most satisfactory house plants. It may not always be in bloom yet its profuse foliage always insures it a welcome in the window garden. (Figs. 24 and 41.)

Geraniums are fond of the sun and should be given the lightest window if they are expected to flower. In former years, plants three to four

Fig. 41. The old favorite

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feet high fairly covered with flowers were not uncommon.

Geraniums of various colors are on the market but only the free bloomers should be selected for the window garden. In addition to the varieties of *Pelargonium*, commonly called the geraniums, there are other species which are also desirable for the window garden. Among these are the ivy-leaved geraniums, Lady Washington geraniums and numerous scented forms such as the rose, nutmeg, and lemon geraniums.

Young plants may be easily raised from cuttings at any time during the cooler months. The cuttings may either be planted in sand in the cutting box, or be potted separately in small pots in a mixture of two parts loam and one part sand. No fertilizer should be used in this soil. During the time of rooting the cuttings must be protected, as in Figs. 26 and 27. When rooted the plants may be shifted to larger pots using soil prepared after formula No. 1. This same soil answers in the shifting of large plants.

If the plants to be used for the window garden have been grown outside during the sum-

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mer, they should be carefully lifted before there is any danger from frost. When the plants are large they should be cut back somewhat to make them more symmetrical.

HELIOTROPES

Where a light sunny window is available heliotropes may be grown with success. These may be secured in several varieties, varying from white to the deeper shades of purple. All are sweet-scented. (Fig. 12.)

Care should be taken that the soil never dries out entirely as it results in the loss of the leaves and the blighting of the flower-buds.

Young plants are easily raised from cuttings or seed. Plants no longer desired for the window may be planted in the garden and will bloom all summer. Those to be used in the window garden, however, should be kept growing in pots, as they are very difficult to lift from the open soil.

A light rich loam, such as that of formula No. 1, makes a very congenial soil for the heliotropes.

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IMPATIENS

There are no more desirable plants for the dwelling than the Impatiens or ever-bloomers. As they are seldom without flowers, they al-

Fig. 42. The Impatiens

ways add a touch of color to the window garden. There are two forms equally suited for house culture. The old form, *Impatiens sultana*, has flowers of a rose-pink color while those of *Impa-*

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tiens holstii, the latest introduction, are of a bright vermilion color. (Fig. 42.)

They do best in a south or west window, where they can secure abundant light. During the summer they may be planted in the open, but should be given a situation protected from the hot midday sun.

Propagation is easily effected either by seeds or by cuttings. The cuttings root readily in sand when kept in a warm room.

The soil best adapted to the Impatiens is a rather light and rich loam, (Formula No. 1.)

OXALIS

The oxalis is an old-fashioned flower easily grown and seldom attacked by insects. The various forms do equally well as pot or basket plants, but when grown in baskets they should be massed by themselves to give the best results.

Most of the forms suitable for the window garden are raised from bulbs and are propagated by bulb division.

They thrive best in well drained loam. (Formula No. 1.) In potting keep the tops near the

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surface and use standard pots to give plenty of root space. A number should be placed in each pot so as to secure a mass of foliage and flowers. When in bud and flower they should receive occasional applications of liquid fertilizer.

Plants for winter blooming should be started in August or September. When the plants are through blooming and the foliage has begun to die, water should be gradually withheld and when the tops become dead the pots should be laid on their sides, and stored in some dry place. They should be kept in this condition until planting time, when the bulbs may be taken out and repotted in fresh soil.

POINSETTIA

The poinsettia with its cluster of large scarlet bracts should be found in every window garden. Blooming as it does at Christmas time, it not only adds a touch of color to the window when other flowers are scarce, but is doubly welcome since the large scarlet bracts which surround the flower cluster remain on the plant in full brilliance for from four to eight weeks.

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After blooming, the plant may be removed to the cellar and set in a dry place where it will not freeze. It then requires no more attention until the following spring. In June it should be brought up and all the soil shaken from the roots. The plant should be cut back, until only one or two eyes of the previous season's growth are left. (Fig. 9.) It may then be repotted, using soil prepared according to formula No. 1. After watering thoroughly it may be set out in the yard for the summer. In the fall when the weather begins to get cool the plants should be removed to the house as they are likely to lose their leaves if chilled. When well established they should be watered carefully and treated occasionally with liquid fertilizer.

PRIMULA

There are several kinds of primulas that make satisfactory house plants. The old fashioned primrose, *P. sinensis* (Fig. 23), is perhaps the best, although *P. obconica* (Fig. 43) becomes larger and produces a greater abundance of flowers. In addition to these there is a smaller

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form with an abundance of small flowers, known as the baby primrose (*P. forbesii*).

Primulas do best in a light window but require a cool room and a position well removed

Fig. 43. *Primula obconica*

from the fire. They can safely stand a night temperature of from 45 to 50 degrees. When grown in a high temperature the plants become drawn and the flowers small and less numerous.

The primulas should be watered freely, the

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soil never being permitted to become dry, since the plants are quickly injured by drying out.

A rather rich porous loam such as may be prepared by adding a little leaf-mold to formula No. 1 is best adapted for primulas. If no leaf-mold is at hand use No. 1 alone. Care must be exercised in shifting primulas to see that the base of the plant rests firmly on the soil although it should not be buried. If planted too shallow so that the plant hangs to one side, it may easily be held erect by the simple device of three small sticks set close to the plant in the form of a triangle.

During the growing season, water as you would a geranium, carefully avoiding over-watering.

ROSES

Roses seldom make good house plants, as they are easily affected by the changes of temperature in the house and are readily attacked by mildew.

If an attempt is made to grow them they should be potted in soil such as is given in formula No. 3, and kept in a warm room.

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SAXIFRAGA

The strawberry geranium or *S. sarmentosa* makes one of the best of basket-plants. It reproduces readily from runners in the same way as the strawberry and these hanging over the side add greatly to the beauty of the basket.

The best basket for the strawberry geranium is one made of wire, as the most striking effect is produced by covering the sides as well as the top. This effect is secured either by placing small plants in the sides when the basket is being filled or by pinning the runners to the moss and allowing them to root there.

The soil best suited for the strawberry geranium is a good loam such as may be prepared from formula No. 1.

CHART

PAGE	METHODS OF PROPAGATION	SOIL FORMULA	EXPOSURE	TEMP. (F)
Amaryllis 129	Off-sets	No. 1	Sunshine	60-70
Araucaria 115	Seed	No. 1. Leaf Mold..	Light	55-60
Asparagus.... 111	Seed	No. 1	Sunshine	60-70
Aspidistra.... 114	Division	No. 1	Sun or shade..	60-75
Azalea		No. 2	Partial sun...	50-70
Begonia.... 132	Cuttings	No. 2. Manure	"Shade"	55-70
Cactus	Seed and Cuttings	See description...	Sun	55-70
Calla..... 133	Off-sets	No. 1	Sun	60-70
Carnation ... 136	Cuttings	No. 1	Sun	55-65
Chrysanthemum..... 137	Cuttings	No. 1	Sun	55-65
Cyclamen 140	Seed	No. 2	Partial shade..	50-60
Cyperus.... 116	Seed and Division	No. 1	Sun	65-70
Ferns..... 117	Spores & Runners	No. 2	Subdued light	55-70
Freesia..... 109	Bulbs	No. 1	Sun	60-70
Fuchsia	Cuttings	No. 1. Leaf Mold..	No hot sun...	55-65
Geranium.... 142	Cuttings	No. 1	Sun	50-70
Grevillea.... 121	Seed	No. 1	Sun	55-65
Heliotrope ... 145	Cuttings	No. 1	Sun	60-70
Hyacinth.... 103	Bulbs	No. 1		55-70
Impatiens.... 146	Cuttings	No. 1	Early Sun....	60-70
Lilies	Bulbs	No. 1	Sun	50-70
Lily-of-the-Valley 108	Rhizomes	No. 1. Sand		65
Narcissus.... 106	Bulbs	No. 1	Partial Sun...	55-70
Oxalis..... 147	Bulbs	No. 1	Sun	60-70
Palms..... 121	Seed	No. 3	Shade	60-70
Pandanus ... 125	Seed and Cuttings	No. 1	No direct sun.	65-70
Poinsettia ... 148	Cuttings	No. 1	Sun	60-70
Primula	Seed	No. 1	Sun	60-70
Roses..... 151	Cuttings	No. 3	Sun	60-70
Rubbers.... 126	Cuttings	No. 1	Partial shade..	55-70
Saxifraga.... 152	Runners	No. 1	Sun	60-70
Tradescantia. 128	Cuttings	No. 1	Partial shade..	60-70
Tulip	Bulbs	No. 1	Partial shade..	55-70