Commercial Carnation Culture

J. HARRISON DICK

VASE OF MODERN CARNATIONS. THE VARIETY IS MATCHLESS

COMMERCIAL CARNATION CULTURE

A PRACTICAL GUIDE
TO MODERN METHODS OF GROWING THE
AMERICAN CARNATION FOR
MARKET PURPOSES

ILLUSTRATED

Edited by
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Speaking of it in the broadest terms, the Carnation is a very remarkable flower and no society and no person has yet fully done justice to its history or to all the attributes surrounding it. We believe we are fulfilling a need in publishing COMMERCIAL CARNATION CULTURE. Much useful and informative matter has been collected, and the plan that we began in "Sweet Peas for Profit," of having cultural treatises from different sections of this continent, has been followed. Acknowledgment and hearty thanks are herein tendered to those who have assisted with contributions as mentioned in the following list:

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A. A. Pembroke, Beverly, Mass.—"Varieties of the American Carnation."
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FOREWORD

We have in the Carnation one of the great flowers of the ages, ranking only second to the Rose in universal esteem. The Carnation has been a favorite flower of the peoples of all degree for at least 2000 years. It is a flower older than any earthly dynasties, and has been the subject of consideration by poets and philosophers these hundreds of years.

In memory we go back to the time when it was cultivated, probably as a single-flowered plant in the gardens of the Greeks and Romans. By selection and care the Clove Carnation in many varieties had already become a handsome double flower some 400 years ago, at which time records of it again emerge. Its elasticity of constitution made it highly susceptible of improvement and in patient, careful hands it divided into several distinct types, and down to the present day new sections are still being evolved.

It is doubtful whether the older, hardy kinds, so much beloved by European fanciers, have been greatly improved in the last two or three generations. There are, indeed, one or two varieties whose history goes back nearly a century. Progress, nevertheless, has been made, especially among the yellow-ground Carnations.

Then the uprise of the American Carnation marked a very distinct divergence, the climax of which has not yet been reached. Only a few years ago the late John Thorpe predicted that the diameter of our Carnation blooms would one day be 4 in. His prediction was soon fulfilled. Since

then, by cross breeding with the Malmaison Carnation, even larger flowers than this have been developed, and this characteristic has, moreover, been united with the perpetual flowering trait of the American Carnation.

It is not generally known just how varied are the colors of this flower; our commercial Carnations are so much confined to white, pink, scarlet, crimson and yellow, that mauve, purple and the beautiful fancy combinations that have arisen in the perpetuals in recent years are almost overlooked by many of us. Even if only for the sake of variety one would like to see more of these novel shades.

American cultivators have a very pure type or strain, and happily, by the careful awards made by the judges of the American Carnation Society, the merits of the commercial Carnation are very carefully and rigidly preserved and safeguarded. The result of this has been and is that the American Carnation has obtained pre-eminence all over the world for its qualities of vigor, floriferousness, and the brightness and general excellence of its flowers. It has done this against some prejudice and even opposition, but "truth will out": there could be no check for any length of time to the filling of its true position by a subject of such sterling superiority. Even as a border or bedding plant it is challenging the European Carnation in its own field.

Although the flower may have its dark periods, when other favorites seem to crowd it a little and depreciate its value in the public eye, these are only temporary, and a flower so graceful, so bright, so fragrant and free can never be submerged nor relegated to any inferior position. It will in the future, as for so many lifetimes behind us, remain one of the best beloved of all the flowers.

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CHAPTER I

The Carnation Family

To mention botany is to frighten off a good many lovers of garden flowers, who may be extraordinarily enthusiastic in the cultivation of their favorites, but seldom dip very far into the study of their scientific relationships.

Montagu C. Allwood, in "The Perpetual Flowering Carnation," more neatly than any one else, has expressed the relationship of the members of the Carnation family: "All Carnations of the present day, in their various classes, from the gigantic Souvenir de la Malmaison down to the humble little Dianthus glacialis, are connected; but Dianthus Caryophyllus, more commonly known as Pink, is the branch of this large family which is more closely connected with our modern flower, and is a native of Southern Europe."

There is a large number of members of this Carnation family, which the botanists call "the natural order Caryophyllaceæ," and their relationship is based upon the botanical similarity of their flowers, stems and leaves. There are said to be about sixty genera and eleven hundred distinct species, a species being the true wild original type. Some of these "types," because of their nobility and natural beauty, were taken into gardens ages ago and under the fostering hand of the owners of the gardens they gradually became improved. Such was and has been the case with the types (or species) called Dianthus Caryophyllus,

parent of all the Carnations; Dianthus plumarius, parent of the hardy Garden Pinks; Dianthus barbatus, parent of the whole race of Sweet Williams; and so on.

When once improvements were begun they were,

N. J. Ex. Stat.

SINGLE CARNATION

generally speaking, maintained. So it comes that by selecting always the biggest and best blooms and propagating from them, and then in more modern days combining the desirable attributes of different varieties by hybridizing, the gardeners and florists of the past very slowly and gradu-

ally evolved the fine races of flowers we possess and admire today.

But all the original types or species were not treated in this way. Many of them remain just as Nature made

N. J. Ex. Stat.

PRESENT DAY COMMERCIAL TYPE OF DOUBLE CARNATION

them, or with comparatively little change. It often happens that a species does not prove tractable or amenable to improvement, or man's idea of improvement. In that case the plant remains true to its wild type, yet it may be so pretty and charming that it remains a desirable garden

plant. The growers therefore either raise it artificially in their nurseries or obtain fresh supplies from the hill lands and natural habitats of the south of Europe, where most of the Dianthuses grow wild.

Professor Asa Gray, in his "Manual of Botany," mentions the following four species of Dianthus as having become *naturalized* in America:

D. ARMERIA, L. (Deptford Pink.) Annual; flowers clustered; bractlets of the calyx and bracts lance-awl-form, herbaceous, downy, as long as the tube; leaves linear, hairy; petals small, rose color with white dots, crenate.—Fields, etc., eastward. July.

D. PROLIFER, L. Annual, smooth, slender; flowers clustered; bractlets ovate, dry, concealing the calyx; leaves few, narrow, linear, erect; petals small, pink.—N. J. and E. Penn.

D. DELTOIDES, L. (Maiden Pink.) Perennial; leaves short, narrowly lanceolate, downy and roughish; flowers solitary; bracts ovate, half as long as the tube; petals rose color or white, toothed.—Mich., L. H. Bailey.

D. BARBATUS, L. (Sweet William.) Perennial; flowers fascicled; leaves large, lanceolate; bracts filiform-attenuate, equalling the calyx.—Sparingly spontaneous.

In addition to these there are quite a number of other Dianthuses or Pinks that are cultivated either in beds or rock gardens, among which the following may be mentioned:

D. ALPINUS, a favorite rock garden plant, with rose-colored flowers; D. CÆSIUS, called in England, where it grows wild, the Cheddar Pink, a beautiful, hardy Pink with rose-colored flowers; D. CHINENSIS, the Indian or China Pink, a well-known annual, the variety Heddewigii

being one of the best, also laciniatus; D. KNAPPII, with pale yellow flowers; D. NEGLECTUS, with highly attractive, greenish blue foliage in tufts, and rose-colored flowers;

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STEMS AND LEAVES OF (1) DOUBLE AND (2) SINGLE CARNATION

D. PLUMARIUS, the Feathered Pink, or Pheasant's Eye, being the parent of the numberless race of Garden Pinks, a very famous species; and D. SUPERBUS, commonly known as the Fringed Pink.

The natural order Caryophyllaceæ, Pink or Clovewort order, is described in Oliver's "Systematic Botany," as: "*Herbs* with swollen nodes; opposite, sessile and usually connate, entire, and usually exstipulate leaves; and regular cymose flowers. *Sepals* 4-5, free or connate; the other parts of the flower sometimes separated from the calyx by a short stalk or gynophore. *Petals* 4-5, rarely wanting, usually clawed, hypogynous or sub-perigynous. *Stamens* 8-10, or rarely fewer, hypogynous or sub-perigynous; filaments sometimes connate at the base. *Ovary* 1-celled by breaking down of the dissepiments in growth, or 3-5-celled at the base, with few or numerous ovules arising from the free-central placenta or axis; *styles* 2-5, stigmatic down the inner surface. Fruit a capsule dehiscing by valves or short teeth. *Seeds* small, albuminous, with a usually curved embryo and a sculptured testa. A large order, occurring chiefly in the temperate and cold regions of the Northern hemisphere; some of them extending into Arctic and high mountain regions; and having affinities with Portulaceæ, Illecebraceæ, and Chenopodiaceæ. They are mostly devoid of active properties, a few only containing the deleterious principle called saponine." The principal genera or families of the order are DIANTHUS, or Pink; SAPONARIA, or Soapwort; SILENE, or Catchfly; LYCHNIS, or Campion; SAGINA, or Pearlwort; ARENARIA, or Sandwort; CERASTIUM, or Chickweed; STELLARIA, or Stitchwort; and GYPSOPHILA, or Baby's Breath.

CHAPTER II

Development of the Carnation

From what has been said in the preceding chapter, it will be understood that our present-day commercial Carnations, which are grown by millions all over this country and in many other countries of the world, are a development of one particular member of the Dianthus family. More than this, they are derived from a special strain or section of Dianthus Caryophyllus. This plant has been cultivated possibly for well over 2000 years, for the scholars tell us that the earliest historical allusions to this dainty and precious flower occur as long ago as the period before the coming of Christ. That statement is more impressive of the antiquity of this much prized plant than any other that could be made.

The American Carnation came from a French strain over 70 years ago. Yet Carnations had split up into other strains before then, these being developed according to the tastes and ideals of the florists in the several countries where they were found. The English and Germans had (and still have) their Border Carnations, the varieties of which are sub-divided or classified into selfs, Picotees, bizarres, fancies and flakes. It is to these forms of the Carnation that the National Carnation & Picotee Society of England devotes itself. Since the year 1900, however, interest in the American strain of Carnation has eclipsed the interest in

the old English hardy Border varieties. Italy, France, Spain, Holland and Germany have each also paid marked attention to the American strain of the Carnation. There is in France the biennial Grenadin type, which is largely treated as an annual, and which throws both single and double flowers. The Marguerite (or Margaret) kinds are also popular in European countries, France particularly, because they yield armfuls of good flowers, even from sowings made the same year. The "Riviera" Carnations are closely allied to these. As for the large Malmaison Carnations, these, too, originated in France—one authority* says in 1857—but they were very early cultivated in Scotland, where some fine varieties were raised.

After this brief statement of facts we come down closer to details, although nothing like an exhaustive history of Carnations is here attempted. Going back to 1629, at which date John Parkinson's floricultural book, "Paradisus Terrestris," was published, he, as one of the earliest authoritative writers, furnishes a very satisfactory account of our flower in those days. Half a century earlier than that, Thomas Hill described its cultivation in the "Proffitable Arte of Gardening," and Gerarde in 1597 had shown that here was a flower that the old monks in their monastic gardens, and other lovers of flowers, had already taken considerable care of. We will quote Parkinson's own words:

Caryophyllus hortensis. Carnations and Gilloflowers.

To avoid confusion I must divide Gilloflowers from Pinkes and intreate of them in several Chapters, of those that are called Carnations or Gilloflowers as of the greater kinds in this Chapter; and of the Pinkes as well double as single, in the next. But the number is so great that to give severall descriptions to them all were endlesse, at the least needlesse. I will therefore set downe onely the descriptions of three (for unto these three may be referred all the other sorts) for their fashion and manner of growing, and give you the severall names of the rest, with their variety and mixture of colours in

* R. P. Brotherston in "The Book of the Carnation," p. 35.

CARNATIONS OF 300 YEARS AGO

1, Master Tuggie's Princess; 2, the French or Oxford Carnation; 3, the Westminster Gilloflower; 4, the Bristow Carnation; 5, the Chrystal or Chrystalline; 6, the Striped Sauadge; 7, the Granpere or Greatest Grenado; 8, the Dainty; 9, John Witty's Great Tawny Gilloflower; 10, the Stript Tawny; 11, the Marbled Tawny; 12, Mashe Tuggie's Rose Gilloflower. (From "Paradisus Terrestris.")

the flowers, wherein consisteth the chiefe difference. I account those that are called Carnations to be the greatest, both for leafe and flower, and Gilloflowers for the most part to bee lesser in both; and therefore, will give you each description apart, and the Orenge tawnie or yellow Gilloflower likewise by it selfe, as differing very notably from all the rest.

This classification of Carnations was probably the first ever attempted, and Parkinson then proceeds to name and describe, (I) the Great Harwich or old English Carnation; (II) the Red or Clove Gilloflower; (III) the Yellow or Orange Tawny Gilloflower. Following this he gives a condensed description of nineteen varieties of Carnations, and twenty-nine varieties of Gilloflowers (Gillyflowers). These are all quite apart and distinct from the "small wild Gilloflowers" or Pinks, descriptions of which are also given. As Parkinson was in constant correspondence with friends on the Continent, it may be assumed that he knew and described all the leading, well marked varieties of the flower as known and grown in Europe in his day. He was acquainted with Theophrastus's reference to the *Dios anthos*, and adds, "Some would have these to be the same as the Carnations and Gilloflowers (July-flowers)." The scent of the ordinary red Gilloflower much resembled the Clove of commerce and the name Caryophyllus is in allusion to this, the Clove being called Caryophyllus aromaticus. The Dios anthos (*Dios*, God; *anthos*, a flower, the Dianthus or Divine Flower) is also from the ancient Greek. The name might also be translated as "Jove's flower," Jove being the chief divinity of the ancients. On the other hand, the English name, Carnation, is of doubtful meaning, but generally understood to have been applied to distinguish a deep red color. Other etymologists believe it to be from "Coronation," suggesting that the flowers were much used for weaving into crowns or chaplets for the head.

With the passing of the centuries the Carnation had its

CARNATIONS OF 300 YEARS AGO

1, The Great Old Carnation or Gray Hulo; 2, the White Carnation; 3, the Camberwell or Poole Carnation; 4, the Fair Maid of Kent; 5, the Blush Sauadge; 6, the Gredeline; 7, the Grimelo or Prince; 8, the Great White Gilloflower; 9, Master Bradshawe's Dainty Lady.

ups and downs, and on the balance of things was making progress. By the end of the seventeenth century very large flowers in numerous colors, some of them flaked and edged, were in greatest favor, and the biggest bloom with the best burst calyx, a Burster, was the most prized of all.

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DISSECTION OF A DOUBLE FLOWER—A LONG WAY FROM THE FIVE-PETALLED PINK

If the calyx did not split the flower was a Whole Blower, and the gardeners used to help matters along by slitting the calyx either with a penknife or scissors. This vogue continued seemingly, until the opening of the nineteenth century. Philip Miller in his "Gardeners' Dictionary," in the middle of the eighteenth century, mentions it, and advice as to splitting occurs for half a century after that. But the ideal form of the Carnation of those days was very

similar to our ideal of today—high in the center, spreading and rounded. In 1702 Ray named 360 good sorts of Carnations; and Hogg, in his treatise on the Carnation in 1820, gives a catalogue of about the same number.

THE AMERICAN STRAIN

The type called Tree Carnation had been in cultivation for fully a hundred years, and was grown as a pot plant for flowering in greenhouses both in Europe and America until the American strain began to edge it off the stage. The challenge of the new race, the race or strain to which this book is almost entirely devoted, was first registered in the year 1842.* The American Carnation came out of France. It was derived from the former French Remontant (literally, remounting or everflowering), out of which a grower named Dalmais, of Lyons, France, raised the first perpetual blooming variety. The immediate progenitor of Dalmais's variety was one called Carnation de Mahon, which flowered in November, fertilized with pollen from one called Biohon, the offspring being again crossed with a Flemish type of Carnation, and recrossed and selected until a distinct strain was obtained. The first of the name varieties was named Atim. In a period of two or three years he raised many improved varieties, but they were, in the main, tall growing, like the old Tree Carnations, and straggly.

Monsieur Dalmais's work was continued by two other growers of the same town, namely, M. Schmidt, on whose heels followed M. Alphonse Alegatiere, who each assisted in the improvement of the earlier type, the latter most notably. Two of his varieties, Edwardsii and La Purité, were grown for many years in the United States.

*See "American Florist," fourteenth number, 1886.

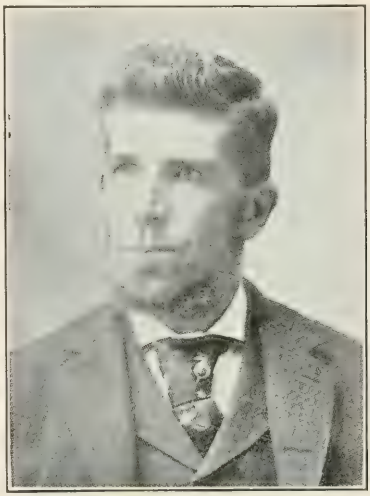
Meanwhile, in 1852, a compatriot of these Frenchmen, named Chas. Marc, situated at Flatbush, Long Island, New York, had been able to introduce some of their seedlings to this country. That is all we hear of him, but in 1856 the name of Dailledouze appears, the firm Dailledouze, Zeller & Gard, then of Flatbush, L. I., having obtained seed of the new perpetual flowering strain from a friend in Lyons. This firm began the work of cross breeding Carnations in America, which work was continued during the next generation, and from time to time notable and superior varieties were introduced. In 1872 the Dailledouze firm issued a catalogue of 54 varieties, and nearly at the same time the variety Victor Emmanuel, which caused such a sensation, was introduced by Donati, another Frenchman, at Astoria, L. I., so that it will be seen how much we owe to the work of the French growers in the laying of the foundations of this fine type of flower.

JOHN DAILLEDOUZE

Born Geneva, Switzerland, 1828; died Brooklyn, N. Y., 1882. One of the first raisers of Carnations in America.

M. Donati was also the raiser of the yellow variety Astoria, named after Astoria, in Long Island, generally recognized as the progenitor of the yellow varieties of today. In 1876, Rudolph Hinze raised the white named after himself. It was this variety, Hinze's White, which was used as the principal parent when Mr. Dorner began his crossbreeding in 1888, and was referred to by him as the source of his best varieties.

Chas. T. Starr was another of the early raisers, and indeed one of the most successful in his time. He contributed up to his death, in 1895, no fewer than 55 varieties, the best of which was Buttercup, which was disseminated in 1884. Grace Wilder, by Jos. Tailby, became and remained the standard rose-pink variety until the appearance of the universally grown and famous variety Wm. Scott. This was raised in 1893 by Mr. Dorner, and was the most notable pink of its day, and long remained so. Three years previously the world-famous white variety, Lizzie McGowan, was introduced, and it, too, had a tremendous sale, being cultivated not only in this country, but throughout Europe and other parts of the world until within a few years ago by the hundred thousand.



JOHN THORPE

Born Leicester, Eng., 1841; died Chicago, 1909. A notable florist and one of the founders of the S. A. F. & O. H.

John Thorpe, affectionately called "Uncle John," and W. P. Simmons, both of whom were true lovers of the Carnation, and filled a large part in the history of its development and exhibition during the 80's and 90's, introduced Portia, Tidal Wave, Daybreak and Silver Spray.

In 1890, Sewell Fisher's Mrs. Fisher appeared, and took its place as one of the leading whites. At this time E. G. Hill was also quietly at work crossbreeding, and among other novelties introduced Flora Hill, referred to more fully subsequently. It took a leading place as a white for several years, with Hill's America as a scarlet.

The veteran R. Witterstaetter was also an eminent and successful raiser in his day, happily still with us, and from his hands came the varieties Estelle, Afterglow, Aristocrat, and Pres. J. A. Valentine, the latter registered as recently as in 1912. John Hartje raised and sent out the fine scarlet Jubilee. These, with the addition of Dorner's and Peter Fisher's later varieties, also Mr. Ward's and a few others still undergoing a final test as successful commercial varieties, bring the record abreast of the present day. The two last named vie with Dorner as successful cross-breeders.

Varieties Registered to the Year 1900

For the sake of completing as far as possible the record of the earlier varieties, with a brief description of the color, and date of introduction, name of raiser, etc., we append the following list of those that were introduced in America, or registered with the American Carnation Society up to and including the year 1900. When the disseminator is other than the originator, both names are given, the originator preceding. These lists appeared in the annual reports of the American Carnation Society:

[*1863-1893*]

A. C. Fitzpatrick, Simmons, white, striped crimson.
Ada, 1891, Davis, dark purple.
Adelaide, 1892, delicate pink.
Albany, carmine pink.
Alegatiere, 1881, Alegatiere, red.
Alexander, 1891, Ussing, deep pink.
American Banner, white, striped carmine, edged with crimson.
American Flag, 1890, Bergman, white, striped scarlet, sport from Portia.
American Florist, 1888, Starr, rosy orange, variegated with carmine.
American Wonder, Syn. of La Favorite.
Amy, 1880, white, striped pink.
Amy Phipps, 1888, Simmons, yellow, striped red.
Andalusia, 1884, French origin, sulphur yellow.
Angelus, 1891, Shelmire, deep pink.
Anna Webb, 1885, Fisher, crimson.
Annie Wiegand, 1891, Dorner, Hill, light pink.
Anthony's Pink, Syn. of Chas. Sumner.
Astoria, 1863, Wilson, yellow, marked with crimson and scarlet.
Astoria Bertine, orange, mottled crimson.
Attraction, 1892, Dorner, a shade between scarlet and crimson.
Aurora, 1892, E. Swayne, light pink.
Avalanche, 1892, dark, rich pink.
Avondale, 1880, Starr, white, edged with purple and maroon.
B. A. Elliott, Syn. of Secretary Hunt.
Baltic, dark maroon.
Banner, 1893.
Bayard Taylor, 1880, Starr, white and crimson.

Beatrice, salmon.
Beatrice White, 1884, white.
Beauty, 1882, Hill, rose.
Beauty of Oxford, 1889, pink.
Ben Halladay, Europe, yellow.
Ben Hur, 1892, Dorner, Hill, pink.
Bertha Soper, 1890, pink.
Bertha Stahl, 1893, Edwards, carmine pink.
Black Knight, 1886, Thorpe, crimson.
Black Prince, 1885, crimson.
Blanch, 1893, Dorner, white.
Blizzard, 1888, Starr, yellow, striped red.
Bohemian Girl, Campbell and Kennedy, deep salmon, shading lighter, sport from Snowden.
Boissy, 1886, French, light yellow, splashed white.
Bonny Doon, Henderson, bright magenta.
Boule de Niege, similar to Edwardsii.
Bouton d'Or, French, yellow, marked with crimson.
Brewster, 1889, Starr, dark pink.
Brunette, Lonsdale, rich crimson.
Brutus, 1893, Shelmire, scarlet, sport of Cæsar.
Brusses, 1881, Starr, crimson and red.
Bryant, Simmons, soft lake, striped crimson.
Buster, 1892, Lenton, dark red.
Buttercup, 1878, Starr, yellow, striped scarlet.
Cæsar, 1891, Shelmire, salmon pink marked red.
Calico, 1883, Starr, creamy white, terra-cotta and crimson.
Canada, 1891, dark pink.
Cardinal, Fisher, deep maroon, spotted white.
Catherine Paul, 1884, pink.
Century, 1886, Starr, dark pink.
Charles Henderson, 1884, Thorpe, pink,
Charles Sumner, 1868, Bock, light pink.
Charmer, 1885, pink.
Chastity, 1890, Starr, rosy pink.
Cherry Lips, 1891, Dorner, Hill, pink.
Cherry Ripe, 1884, cherry.
Chester Pride, 1877, Edwards, Starr, white, striped scarlet.
Christmas, 1890, Starr, light pink.
C. J. Clarke, 1884, Simmons, red.
Clara Morris, 1886, Simmons, white splashed crimson.
Clifton Fisher, 1886, Fisher, crimson.
Cloth of Gold, 1888, yellow.
Columbia, 1886, Thorpe, salmon marked with crimson.
Constancy, 1891, Starr, scarlet.
Cora Collins, Brinker, lemon yellow.
Creole, 1891, Dorner, dark crimson.
Crimson Coronet, 1892, Creighton, crimson.
Crimson Velvet, 1887, crimson.
C. Schmitt, 1890, white.
Cymbeline, 1884, Thorpe, red, striped white.
Daisy, 1875, blush.
Darkness, crimson maroon.
Dawn, 1886, Starr, pink centre, shading white at edges.
Daybreak, 1891, Simmons, light salmon.
Delaware, 1893, Brinton, white, striped scarlet.
Delicata, 1888, cream white, edged pink.
Diadem, 1870, dull red.
Diamond, 1893, Brinton, white, with pink tinge.
Dolly Varden, Henderson, buff, striped crimson and maroon.
Dorinda, 1892, Fewkes, Lombard, pink.
Dorothy, 1891, Shelmire, deep pink.
Dr. Smart, 1893, Dorner, pink cream, striped crimson.
Duke of Orange, 1878, Starr, orange, striped red.
Eastern Queen, Wood Bros., orange, striped red.
Eclipse, 1881, red.
Edelweiss, 1891, Shelmire, white, sport from Chester Bride.
Edna Craig, 1893, Dorner, Hill & Craig soft bright pink.
Edmons, scarlet.
Edwardsii, 1866, white.
Edwin Lonsdale, 1891, Dorner, Hill, delicate salmon.
E. G. Clark.
E. G. Hill, 1887, Thorpe, scarlet.
Elmont, 1888, crimson.
Emily Louise Taplin, 1891, Burrow, crimson.
Emerson, Simmons, salmon, striped vermilion.
Emperor of Morocco, 1881, dark crimson.
Erminie, 1888, Starr, deep pink.
Esther, 1893, Dorner, light pink.
Eureka, Starr, white, striped peachblow.
Evangeline, 1892, Dorner, white, striped red.
E. V. Low, 1893, McGowan, carmine and yellow striped.
Excelsior, 1893, Brinton, white.
Exquisite, 1892, white, striped pink.
Fair Rosamond, 1884, pink.
Fairy Princess, 1884, Thorpe, white, penciled with maroon.
Fancy, 1883, Starr, scarlet, striped with crimson.
Farragut, carmine and yellow, edged purple and maroon.
Fascination, 1882, Thorpe, similar to Hinsdale.
Fawn, delicate pink.
Ferdinand Mangold, 1886, Simmons, rich crimson.
Field of Gold, 1878, Starr, yellow.
Firebrand, 1881, Reid, Henderson, scarlet.
Firelight, 1893, C. J. Pennock, F. M. Pennock, scarlet.
Fishkill, Wood Bros., white.
Fitzpatrick, 1885, white and pink.
Fleta Fay Foster, magenta, suffused with violet.

Florence Bevis, Graham, pink.
Florence Fisher, Fisher, scarlet salmon.
Florence Van Reyper, 1893, E. J. Van Reyper, white.
Frank McGregor, 1893, red.
Fred. Creighton, 1890, Creighton, light pink.
Fred. Dorner, 1891, Dorner, Hill, scarlet.
Fred. Johnson, 1881, Tailby, light red.
Gauntlet, light carmine.
General Custer, 1891, Shelmire, variegated red and white.
Geneva, 1890, Simmons, lightly striped purple.
George Thorpe, 1884, Thorpe, scarlet.
George Washington, Zeller, white, dotted cherry red.
Germania, 1886, German, yellow.
Gibbonsii, 1880, dark crimson.
Glorious, 1890, dark pink.
Glory of Venice, orange and rose.
Glowing Coal, Syn. of Portia.
Golden Gate, 1889, Starr, yellow.
Golden Triumph, 1892, Lombard, canary yellow, shaded white.
Goldsmith, 1892, rich yellow, striped red.
Governor Russell, 1893, Cummings, McCarthy, white.
Grace Battles, 1893, Lonsdale, C. J. Pennock, delicate pink.
Grace Darling, 1892, Chambers, pink.
Grace Fardon, 1889, Simmons, pink.
Grace Wilder, 1881, Tailby, light pink.
Grenadine, Europe, deep scarlet.
Harriet, 1880, Starr.
Harriet Thorpe, 1884, Thorpe, rose and white.
Harry Palmer, Palmer, scarlet.
Hector, 1891, Wight, Lombard, scarlet.
Helen Galvin, 1893, Wight, light pink.
Henrietta, dark red.
Hesper, 1893, Wight, yellow, striped red.
Hinsdale, 1876, white, shaded lilac.
Hinze's Red, 1879, Breitmeyer, red.
Hinze's White, 1879, Breitmeyer, white.
Holmes, Simmons, white, sprinkled with rose.
Hoosier, 1893, Dorner, pink.
Hugh Graham, 1885, Graham, dark scarlet.
Iago, 1893, McGowan, crimson.
Iantha, Burrow, salmon pink.
Ida McKinley, light pink.
Ida May, Conrad, creamy yellow, splashed with carmine and pink.
Ideal, 1893, Lenton, white, edges marked red.
Imogen, 1884, yellow, striped red.
Indiana, 1892, Dorner, creamy white, striped bright pink.
Innocence, 1891, Dorner, pink.
James Madison, 1878, yellow and crimson.
James Perkins, 1884, Simmons, reddish pink.
Jay Gould, 1884, Thorpe, brick red.
J. B. Jacquier, 1890, French, yellow.
J. B. Kidd, 1886, Simmons, crimson.
Jeanne Morel, yellow, striped purple.
Jeannette, 1882, Thorpe, white.
Jean Sisley, 1882, French, bright scarlet.
Jennie Parker, 1892, dark pink.
Jewell, Lonsdale, delicate pink.
J. J. Harrison, 1886, Simmons, white, marked light pink.
John McCullough, 1886, Simmons, red.
John R. Renere, 1892, Jahn Bros., variegated.
John Thorpe, Dorner, Hill, pink.
Joseph Perkins, 1884, Simmons, dark pink.
Josiah Eaton, Jr., 1892, Jahn Bros., white.
J. R. Freeman, 1890, Starr, light crimson.
J. W. Wolfskill, 1892, C. J. Haettel, rosy flesh.
Juliet, 1884, Thorpe, white, lined red.
J. Y. Murkland, 1883, Thorpe, bright scarlet.
Kaiser Wilhelm, 1887, purple.
Karto, yellow, striped with pink.
Kate, dark flesh color.
Katherine Storrs, 1893, McGowan, particolored.
King Dianthus, 1892, Creighton, white.
King of the Crimsons, 1876, White, crimson.
La Belle, 1870, English, white.
Lady Chattin, Starr, carmine, flaked maroon.
Lady Emma, 1875, Starr, bright scarlet.
Lady Fair, 1890, Starr.
Lady Martha, 1893, Brinton, penciled scarlet and white.
Lady Maude, 1887, Edwards, white.
Lady Rachael, 1891, Larkin, purple.
La Excellent, Starr, white with carmine edge.
La Favorite, 1884, French, rosy carmine.
La Fayette, 1892, Dorner, carmine.
La Purité, 1866, Zeller, carmine pink.
Lasandria, 1891, Starr.
Laura, English, light salmon.
Laura Hempstead, 1892, Hempstead, bright pink.
Lavinia, 1892, Lenton, scarlet, spotted white.
Leon Gambetta, 1892, Haettel, deep scarlet.
Lieut. Gov. Sheehan, white.
Lillian, 1878, Starr, white, striped crimson.
Little Beauty, 1880, Starr, yellow, dotted and edged with rose.
Lizzie McGowan, 1890, McGowan, Chitty, white.
L. L. Lamborn, 1888, W. Swayne, white.
Logan, 1886, Graham, light red.
Lois J. Haettel, 1892, Haettel, white.
Longfellow, Simmons, salmon rose.
Lord Clyde, 1878, Starr.
Louise Porsch, 1891, McGowan, yellow striped red.

Louis Lenoir, 1868, Zeller, dark maroon.
Lowell, Simmons, purple crimson, shaded violet.
Lucia, 1890, Timme, rose pink.
Lucy Singler, 1878, bright pink.
Lulu, 1885, red and pink striped.
Lydia, 1878, Starr, yellow, striped red.
Lyon's White, Syn. of Edwardsii.
Mabel, 1886, Starr, light shell pink.
Maiden Blush, Wood Bros., white, suffused with pink.
Majesty, 1892, Lenton, rich dark pink.
Margery, white, striped vermilion.
Marquis of Lorne, 1884, English, scarlet.
Mars, 1884, bright scarlet.
Marshall P. Wilder, 1884, Thorpe, red striped dark crimson.
Marvel, 1892, dark pink shaded creamy white.
Mary Anderson, 1886, Simmons, white.
Mary Darce, white, tinged with pink.
Maud Granger, 1886, Simmons, rose.
Maude, 1883, Starr, white, slightly penciled with carmine.
May Flower, 1887, salmon pink, striped on lighter ground.
May Queen, 1884, Thorpe, dark pink.
Meteor, Zeller, light red.
Meteor, Syn. of Philadelphia.
Minerva's Pink, 1892, Messmore and Turner, pink.
Miranda, Thorpe, purple.
Miss Moore, French, white.
Miss Joliffe, 1864, French, delicate salmon.
Mlle. Carle, French, white.
Mme. Chassons, French, deep rose.
Mme. Diaz Albertine, 1892, Dorner ,light pink.
Mme. Gobet, French, nankeen yellow.
Mons. Gambetta, Zellar, orange and yellow.
Morning Ray, 1890, Larkin, carmine pink.
Motor, 1890, Starr, salmon, dashed with red.
Mrs. A. Rolker, 1884, Thorpe, salmon.
Mrs. B. Harrison, Larkin, scarlet, mottled maroon.
Mrs. Carnegie, Syn. of Secretary Blaine.
Mrs. Cassell, 1886, blush rose.
Mrs. Cleveland, 1887, Lonsdale, Scott, pink.
Mrs. E. Hippard, Thorpe, orange, penciled with crimson.
Mrs. Elizabeth Reynolds, 1892, Dorner, pink.
Mrs. Ferdinand Mangold, 1884, Thorpe, salmon.
Mrs. Fisher, 1890, Fisher, Lombard, white.
Mrs. Garfield, 1886, light pink.
Mrs. H. C. Frick, Simmons, white; variegated purple crimson.
Mrs. Harris, 1883, white with pink blotches centre of each petal.
Mrs. Harrison, 1891, Dorner, Hill, white, faintly marked purple.
Mrs. Henry M. Stanley, 1893, Shelmire, orange, striped red, sport from Buttercup.
Mrs. J. B. Perkins, 1885, Simmons, red.
Mrs. John W. Colflesh, 1893, Colflesh, bright pink.
Mrs. Keene, Veitch, English.
Mrs. Lemuel Fawcett, 1890, Fawcett, shrimp pink.
Mrs. Lonsdale, 1892, Haettel, rosy flesh.
Mrs. McKenzie, 1878, bright pink.
Mrs. Robt. Hitt, 1892, Dorner, Hill, dark pink.
Mrs. Skinner, Simmons.
Myrtle, 1892, Larkin, yellow, striped crimson.
Nelly Bly, 1891, Shelmire, salmon pink, striped red.
Nellie Lewis, 1891, Lewis, Vick, light pink, striped darker, sport from J. J. Harrison.
Netherwood, 1892, Creighton, scarlet.
New Jersey, 1893, McGowan, red.
Oddity, 1893, Brinton, pink, shaded scarlet.
Ohio, 1891, Simmons, Hill, white.
Old Gold, 1889, bronze yellow.
Old Rose, 1893, McGowan, salmon pink.
Oona, 1892, dark pink.
Orange Blossom, 1892, Jennings, pink shading to white.
Orient, 1886, Fisher, crimson.
Othello, 1884, Thorpe, deep crimson.
Paradise, 1892, Lenton, bright red.
Patti, 1891, Shelmire, white, marked with carmine.
Paxton, 1886, Starr, white, striped with scarlet.
Peachblow Coronet, 1892, Creighton, white, heavily blotched with rose pink.
Pearl, 1892, Chambers, C. J. Pennock, white, sometimes suffused with pink.
Peerless, similar to Edwardsii.
Peter Henderson, 1880, Charlton, Nanz & Neuner, white.
Petunia, 1884, Thorpe, white, striped lilac.
Philadelphia, 1878, Kirschner, light red.
Philadelphia Variegated, Starr, white, heavily edged with crimson.
Pink Beauty, 1892, Jahn Bros., light pink.
Pink of Perfection, Syn. of J. J. Harrison.
Piru, 1892, Lenton, white.
Poe, Simmons, cream speckled with purple.
Pomona, 1891, Starr, crimson.
Portia, 1884, Thorpe, bright scarlet.
President de Graw, 1878, Zeller, Daille-douze, white.
President Garfield, 1882, Simmons, similar to Robt. Craig.

Pride of Essex, 1893, Van Reyper, yellowed striped scarlet.
Pride of Kennett, 1888, W. Swayne, crimson.
Pride of Penhurst, 1884, European, bright yellow.
Princess Louise, 1881, Tailby, rose.
Purdue, 1893, Dorner, deep pink.
Puritan, 1892, Wood Bros., white.
Purple Beauty, purple.
Purple Crown, maroon shaded purple.
Purpurea, 1889, Starr, purple.
Quaker City, 1886, Banyard, Craig, white.
Queen's Scarlet, Syn. of Portia.
Queen of the Whites, English, white.
Ramona, 1892, Lenton, dark red, striped white.
Red Cross, 1891, Dorner, Hill, bright red.
Richmond, 1892, Dorner, dark rose.
Robert Craig, 1887, McCallam, red.
Rob Roy, 1892, Creighton, red.
Roi des Violets, French. purple.
Romance, 1892, Lenton, bright red.
Rosalie, 1892, Essler, rich pink, shaded white.
Rosalind, 1884, Thorpe, pink.
Rose Hill, 1880, Dailledouze, salmon red.
Rosemary, 1889, Starr, pink.
Rosy Morn, Henderson, salmon pink.
R. R. Parker, 1887, Starr, peachblow, flaked with carmine.
Ruth Churchill, 1893, Van Reyper, crimson.
Salmon Queen, 1893, Dorner, E. Asmus, delicate salmon.
Sambo, 1893, C. Eisele, dark crimson, sport of Century.
San Mateo, 1891, Dorner, Hill, light red.
Scarlet Gem, 1886, Graham, Craig, scarlet.
Scarlet King, 1884, Starr, scarlet.
Scarlet Queen, Syn. of Portia.
Scarlet Ray, 1893, Ward, striped scarlet and white, sport of Portia.
Secaucus, 1876, carmine.
Sea Foam, 1881, Hallock & Thorpe, white.
Sea Gull, Dorner, white.
Sea Shell, 1893, Essler, pink, shading light.
Seawan, 1886, Henderson, crimson.
Secretary Blaine, 1886, Simmons, white, striped bright red.
Secretary Hunt, 1886, Simmons, deep crimson.
Secretary James, 1886, Simmons, white, striped scarlet.
Secretary Kirkwood, 1886, Simmons, brilliant crimson.
Secretary Lincoln, 1886, Simmons, solferino and violet, flaked with crimson.
Secretary McVeigh, 1886, Simmons, white, shaded rose.
Secretary Windom, 1886, Simmons, scarlet.
Senator McPherson, 1892, McGowan, red.
Sensation, 1886, Thorpe, yellow, with faint red stripes.
Sentinel, 1893, Dorner, Hill, scarlet.
Shellflower, 1890, Henderson, pink.
Silver Lake, 1884, Fisher, white.
Silver Spray, 1889, Simmons, white.
Sirius, 1892, Haettel, deep scarlet.
Snowball, 1886, white.
Snow Bird, 1891, Jennings, white.
Snow Bound, 1886, white.
Snowden, 1879, J. Henderson, P. Henderson & Co., white.
Snow Flake, 1884, white.
Snow Queen, 1893, C. J. Pennock, F. M. Pennock, white.
Snow White, 1886, P. Henderson & Co., white.
Spartan, 1892, Dorner, brilliant carmine.
Sport, Syn. of Emperor of Morocco.
Springfield, 1876, Muller, rosy pink.
Starlight, 1888, Hancock, light yellow, sport of Hinzie's white.
Star of the West, deep pink.
Striped Unique, 1892, Haettel, pink, striped white.
Sunflower, 1892, Lenton, yellow, striped red.
Sunrise, 1885, Kirschner, Craig, yellow salmon, marked with red.
Sunset, 1887, salmon, striped yellow.
Tecumseh, 1887, Simmons, red.
The Bride, 1889, Tailby, white.
Thomas Cartledge, 1892, E. Swayne, carmine.
Tidal Wave, 1887, Simmons, dark pink.
Topsy, 1880, Starr, deep velvet maroon.
Unique, Dillon, dark magenta, streaked with carmine and pink, sport from Lydia.
Uncle Sam, 1886, Temple, deep crimson red.
Variegated La Belle, Starr, white, penciled rosy carmine.
Variegated La Purité, white, striped red.
Venus, 1878, Starr, light yellow, striped carmine.
Vesuvius, Henderson, dark crimson.
Victor, 1887, Page, red.
Village Maid, 1892, Creighton, blush marked carmine.
Vixen, Starr, bright red.
Volunteer, 1888, Kirk, white, striped rose.
Vulcan, 1892, Crimson.
Wabash, 1892, Dorner, brilliant deep crimson.
Wanderer, 1890, Larkin, white.
Waneta, 1891, Chambers, white.
Washington, 1865, Zeller, red, striped with black.
Waverly, Scott, bright red.
West End, 1885, Jennings, dark pink.
Western Pride, 1893, Dorner, white, striped scarlet.
W. H. Brower, white, penciled scarlet.
Whipper-In, English, scarlet and black

White Beauty, 1893, white.
White Cap, 1892, Lenton, white.
White Coronet, 1892, Creighton, white.
White Dove, 1892, Dorner, Hill, white.
White Gem, 1888, Buxton, white.
White Grace Wilder, 1888, Van Reyper, white.
White La Purité, 1875, white.
White Wings, 1891, Dorner, Hill, white.
Whittier, Simmons, vermilion scarlet.
Wide Awake, 1892, dark red.
Wm. E. Rowland, 1886, Pyfer, pink
Wm. F. Dreer, 1890, Starr, rose pink.
Wm. Pierce, Sr., 1892, Jahn Bros., pink.
Wm. Swayne, 1888, Wm. Swayne, white.
W. W. Coles. 1889, Thorpe, light scarlet.
Yellow Queen, Europe, yellow.
Zebra, 1892, Ward, parti-colored.
Zebra, Syn. of Cæsar.

[*1894-1900*]

Abraham Lincoln, 1895-96, scarlet.
Abundance, 1895-96, vivid pink.
Acquisition, 1894, salmon, Lombard.
Agne, Snow, 1894, pink, Snow.
Alba Perfecto, 1895-96, Betscher.
Alice, 1895-96, rosy pink.
Alaska. 1894, white, Chitty.
Alhambra, 1894, carmine pink, Ingleside Nurseries.
Al. Mailaiken, 1894, flesh color, Ingleside Nurseries.
Alma, 1899-1900, pink, Aul.
Amado, 1894, pure white, Redondo Beach Co.
Amazon, 1897, white, Hake.
A. M. Herr, 1894, scarlet, Hill.
Annie H. Lonsdale, 1895-96, white, Myers & Samtman.
Antonio Maceo, 1897, Bridesmaid pink, Cottage Gardens.
Arcadia, 1894, pink, Redondo Beach Co.
Argyle, 1895-96, bright rose, Stollery.
Armazindy, 1894, very light, Harrison type, Hill.
Augusta Rath, 1897, rose pink, Rath.
Augusta Williams, 1897, white.
Azalea, 1895-96.
Baltimore, 1895-96, pink, Hess.
Belle Bute, 1899-1900, pink, Aldous.
Belle Vista, 1899-1900, light pink, Allen.
Bertha Rath, 1897, white.
Bess, 1894, Weishaar Bros.
Bettina, 1894, crimson, Wight.
Bonibell, 1894, blue-purple, Hill.
Bon Ton, 1897, Blake.
Bride of Erlescourt, 1894, white, Miller & Sons.
Bridesmaid, 1894, pink, Dorner.
Brilliant, 1899-1900, dark pink, McConnell.
Brower, 1895-96, snow white.
Butler, 1895-96, deep crimson.
California Gold, 1899-1900, Sievers.
Captain King, 1894, white, variegated crimson, Pennock.
Cardinalis, 1897, Shelmire.
Casa Blanca, 1894, white, Redondo Beach Co.
Cecilia Schwencke, 1897, Dary Daybreak, Rath
Chas. A. Dana, 1895-96, light pink.
Chas. T. Starr, 1894, bright scarlet, Starr.
Chicago, 1899-1900, scarlet, Chicago Carnation Co.
Christmas Rose, 1899-1900, cerise.
Christina Dorner, 1894, light pink, Dorner.
Chusco, 1894, cream, striped lilac, Redondo Beach Co
Citrus, 1894, Lenton.
Clara Barton, 1899-1900, crimson, Kretschmar.
Cleopatra, 1895-96, orange and scarlet.
Conchita, 1894, pink, Redondo Beach Co.
Corsair, 1894, scarlet, Chitty.
Clifton, 1894, crimson, Vick.
Clio, 1897, light pink, Pennock.
Conquest, 1899-1900, white, Capers.
Couronne de la Vaele, 1894, white, Ingleside Nurseries.
Crimson Wave, 1894, Lenton.
Crystal, 1894, white, Fisher.
Crystal, 1894, Lenton.
Daisy Bell, 1894, white, penciled red, Shelmire.
Dards, 1895-96, bright pink.
Dazzle, 1895-96, scarlet, Dorner.
Dean Hole, 1894, yellow, May.
Defender, 1895-96, carmine, Nicholson.
Dekoo Mitting, 1894, Morris Floral Co.
Della Fox, 1894, deeper than Daybreak, Myers & Samtman.
Diana, 1894, white, Wight.
Dorothy Forbes, 1899-1900, pink, Heilig.
Dr. Del Amo, 1894, white, striped and edged crimson, Redondo Beach Co.
Dr. E. P. Lawrence, 1897, cream white, marked carmine. Rath.
Dr. Patzki, 1894, light pink, striped red, Redondo Beach Co.
Flora Hill, 1895-96, white.
Florence Eddy, 1894, rose, Vick.
Flushing, 1897, purple, Rath.
Fort Wayne, 1897, red, Vesey.
Fred Weir, 1895-96, deep flesh pink, Molatsch.
Freedom, 1897, white, Fisher.
Gaiety, 1897, pink and white, var. Hake.
Gsn. Burnside, 1895-96, white, edged deep rose.

Gen. Sherman, 1895-96, white, penciled light pink.
Gertrude, 1894, Weishaar Bros.
Glacier, 1895-96, snow white.
Gladys Rey, 1895-96, buttercup type, Barnard.
Golden Gem, 1895-96, yellow, buttercup type, Love.
Golden State, 1894, bright yellow, Lenton.
Gov. Markham, 1894, white shaded carmine, Redondo Beach Co.
Gov. Roosevelt, 1899-1900, bright maroon, Cottage Gardens.
Grace Bollinger, 1895-96.
Guiding Star, 1895-96, Simmons.
Henrietta Sargent, 1894, pure yellow, Tailby.
Hiawatha, 1897, cardinal, Pennock.
Hilda, 1894, Weishaar Bros.
Hon. T. B. Reed, 1895-96.
Hon. Wm. McKinley, 1895-96.
Dr. Warder, 1894, crimson, Shelmire.
Du Marchand, 1894, yellow, striped red, Redondo Beach Co.
Earlham, 1894, light pink, Hill.
Edith Foster, 1895-96, White.
Eglantine, 1894, pink, Hill.
Eldorado, 1894, light yellow edged pink, Shelmire.
Eleanor Ames, 1899-1900, Carmichael.
Elizabeth Skinner, 1897, Smith.
Elm City, 1899-1900, white, Kraus.
Emma Lowrey, 1895-96.
Emma Quinlin, 1897, rose pink, Rath.
Emma M. Thompson, 1895-96, pink, Scott.
Emma Wocher, 1895-96, light pink, Witterstaetter.
Empress, 1895-96, dark crimson.
Encante, 1894, pink, edged blush, Redondo Beach Co.
Ethel, 1895-96, white.
Eugene Dailledouze, 1895-96, brilliant carmine.
Eulalia, 1894, light yellow, penciled light pink, Shelmire.
Evalina, 1897, Witterstaetter.
Evening Star, 1895-96.
Flame, 1895-96, bright scarlet, Cottage Gardens.
Flamingo, 1895-96.
Flamme, 1894, salmon scarlet, Ingleside Nurseries.
Ida Feder, 1894, light pink, striped carmine, Redondo Beach Co.
Immaculate, 1895-96.
Ingleside, 1894, flesh color, striped scarlet, Ingleside.
Intensive, 1895-96.
Invincible, 1895-96.
Irene, 1899-1900, pink, Crabb & Hunter.
Isabelle Hunnewell, 1894, buff and sacrlet, Tailby.
Ivanhoe, 1897, Hancock.
Ivory, 1895-96, white.
Jack Frost, 1894, pure white, Swayne.
Jahn's Scarlet, 1897, scarlet, Fisher.
James Corbet, 1894, coppery color, Redondo Beach Co.
James Dean, 1895-96, Bridesmaid pink.
J. C. Ainsworth, 1894, white, striped pink, Feder.
J. C. Sibley, 1899-1900, maroon, Heilig.
John Raynor, 1895-96, deep pink.
Jno. Young, 1895-96, white.
Josephine, 1894, Lenton.
Jos. Jefferson, 1897, Pennock.
Jubilee, 1894, scarlet, Hill.
Jupiter, 1894, white, Lombard.
Kathryne, 1897, White, Fick.
Katy Schafer, 1895-96, Hill.
Keystone, 1899-1900, yellow, Heilig.
Kitty Clover, 1894, yellow and carmine Shelmire.
Kohinoor, 1894, white, Pennock.
Lake City, 1894, white, Taylor.
La Neige, 1894, pure white, Ingleside Nurs.
Laura Degenhardt, 1897, yellow, variegated scarlet.
Laure E. Doly, 1897, light pink, Fick.
Lawrence Thomson, 1894, clear pink Thomson Bros.
Lela Underwood, 1894, Morris Co.
Lena Saling, 1894, deep pink, May.
Letty Coles, 1895-96.
Lily Dean, 1894, fancy striped on white, Chitty.
Little Gem, 1894, striped pink on white, Chitty.
Lizzie Gilbert, 1894, scarlet, Wis. Fl. Ex.
Lonesa, 1894, pink on white ground, Mrs. Starr.
Los Angeles, 1894, pure white, Redondo Beach Co.
Lucy Brenner, 1897, pink and white, Rahner.
Lyone, 1894, delicate shade of pink, Shelmire.
Mabel F. Gray, 1894, salmon rose, Ingleside.
Magnet, 1894, carmine pink, Chitty.
Mapledale, 1894, pink, Smith.
Margaret Rath, 1897, rose, Rath.
Marian 1894, deep scarlet, Shelmire.
Marina, 1894, scarlet, Redondo Co.
Mark Hannah, 1897, Christie.
Martin Wolfskill, 1894, peach, striped crimson, Feder.
Mary Shepherd, 1894, white, Redondo Co.
Maud Dean, 1894, dawn type, May.
Mayor Pingree, 1895-96, Breitmeyer.
May Whitney, 1899-1900, Carmichael.
Meteor, 1894, maroon, Dorner.
Marie Starr, 1894, white, Starr.
McConnell, 1895-96, dark crimson.
Michigan, 1899-1900, dark red, Walker.
Minnie Cook, 1894, pink and white, Chitty.
Miss Blanche Payne, 1897, Carr.

Miss Donnelly, 1894, light pink, Redondo Beach Co.
Miss Helen Gould, 1899-1900, pink, Kretschmar.
M. A. Hunt, 1894, Hunt.
Mme. Chapman, 1899-1900, pink, Crabb & Hunter.
Morello, 1895-96.
Morene, 1894, dark crimson, Redondo Co.
Morning Star, 1897, white, Fisher.
Mrs. Ayers, 1894, lighter than Tidal Wave, Carrol.
Mrs. C. H. Duhme, 1895-96, light pink.
Mrs. Childs, 1894, blush, striped pink, Redondo Beach Co.
Mrs. Chas. M. Fick, 1897, pink, Fick.
Mrs. Mailander, 1895-96, white, Mailander.
Mrs. McBurney, 1895-96.
Mrs. Mary Hallock Foote, 1897, Given.
Mrs. Pauline Gussman, 1897, rose pink, Rahner.
Mrs. T. B. Reed, 1895-96.
Mrs. S. M. Inman, 1895-96.
Mrs. Sprout, 1894, carmine pink, Redondo.
Mrs. Titus, 1894, Lenton.
Mrs. Wm. McKinley, 1895-96.
Mrs. W. S. Potter, 1895-96, deep pink.
Nivea, 1897, white, Cook.
Northern Light, 1897, yellow marked pink, DeWitt.
Oneida, 1897, pure pink, Baker.
Oregon, 1899-1900, pink, Hill.
Pacific, 1894, Lenton.
Paloma, 1894, pink, white edge, Redondo.
Panchita, 1894, white, striped carmine. Redondo Beach Co.
Pat. O'Mara, 1895-96, brilliant pink.
Peachblow, 1894, blush pink, Hunt.
Pearl White, 1894, white, Blauvelt.
Philip Heilig, Jr., 1899-1900, pink, Heilig.
Pilgrim 1895-96.
Pike's Peak, 1897, Given.
Preciosa, 1894, white, Redondo Beach Co.
Princess, 1897, Barnard.
Princess Bonnie, 1894, light pink, Shelmire.
Purple King, 1894, light purple, Pennock.
Queen Louise, 1899-1900, white, Dillon.
Red Jacket, 1897, scarlet, Baker.
Red Wave, 1895-96, Hopkins & Lemke.
Rosa Pizer, 1895-96, Milno.
Rose Queen, 1894, pink, Simons.
Ruby, 1895-96, bright pink.
Saginaw, 1897, pink and white, var., Hake.
Sam Gabriel, 1894, flesh, Ingleside Nurs.
Samson, 1895-96, white, edged light pink.
Sandusky, 1895-96.
Saturn, 1894, pink, Lombard.
Saxon, 1899-1900, scarlet, Fisher.
Scallen, 1895-96, variegated white and scarlet.
Scribners, 1895-96, deep pink.
Sears, 1895-96, brilliant scarlet.
Sea Shell, 1894, Walker.
Sebec, 1897, Fisher.
Shasta, 1895-96, white.
Silver Ball, 1895-96.
Silver Queen, 1894, Albertini type, Hill.
Silver Star, 1895-96, Hancock.
Sir Thos. Lipton, 1899-1900, pink, McKnight.
Small, 1895-96, delicate shell pink.
Snow Crest, 1895-96, snow white.
Snow Drift, 1897, Carrol.
Souriza, 1894, white, striped lilac, Redondo Beach Co.
S. P. Rees, 1894, rosy pink, Feder.
Storm Queen, 1894, white, Dorner.
Storm King, 1897, white, Dorner.
Stumpp, 1895-96, bright pink.
Sulphide, 1894, Harrison type, Hill.
Sunbeam, 1894, scarlet, Hartje.
Sunshine, 1894, yellow, striped scarlet, Christie.
Superior, 1899-1900, salmon, McConnell.
Syracuse, 1899-1900, light pink, Marquisee.
The Copley, 1899-1900, cerise, Greaves.
The Crawford, 1899-1900, red and white, Greaves.
The Grout, 1894, scarlet, Grout.
Thorley 1895-96, brilliant deep rose.
Thos. Caird, 1897, dark pink, DeWitt.
T. H. Spaulding, 1895-96, light pink.
Trilby, 1895-96, bright cardinal, Cloud.
Triumph, 1895-96, bright pink.
Twilight, 1895-96, DeWitt.
Utica, 1897, white, Baker.
Van Houtte, 1895-96, dark crimson, Pierce.
Van Leurens, 1894, Blauvelt.
Vesper, 1894, Hill.
Vice-Pres. Garret A. Hobart, 1897, striped variety, Hagenburger.
Villisca, 1897, purple and white, Rahner.
White Cloud, 1897, white, Dorner.
White Daybreak, 1897, Gasser.
White Queen, 1895-96, white, Nicholson.
Wilhelm, 1897, pink var. white, DeWitt.
Winifred, 1895-96, Hall.
Wm. I. Burke, 1897, canary yellow, Rath.
Yellow Jacket, 1894, yellow and scarlet, Passmore.
Young America, 1899-1900, deep pink, Totten

FRED DORNER'S WORK

Looking over later lists of historic Carnations, and over the names of their raisers, one or two among these latter stand out pre-eminently, and first that of the late Frederick Dorner. Mr. Dorner conducted "the most systematic work in developing the Carnation, and succeeded in producing a strain which is recognized as the highest development of the American Carnation. His records cover a period of twenty-one years, and contain a complete list of many thousands of Carnations during that time. This strain is distinguished for its easy growing habit, its freedom and steadiness in producing blooms, and diversity of colors and its adaptability to commercial growing."* It was fitting that the American Carnation Society should have perpetuated the memory of Mr. Dorner by instituting the memorial gold medal that bears his name, and which is annually awarded now at its exhibitions to the raiser of the best undisseminated seedling of the year. At the society's meeting at Detroit, Michigan, in January, 1912, a paper was read by Prof. H. B. Dorner on the hybridizing work and methods of Frederick Dorner.†

Frederick Dorner, Sr., was born in 1837 in Baden, Germany, in a town situated in the Black Forest region, and came to America in 1855 in his eighteenth year. He first obtained employment as a florist at Lafayette, then went farming, and in 1865 migrated to Wisconsin, still in the farming line, until 1870, when he returned to Lafayette and started on his own account as a florist; here he built greenhouses, and becoming successful, bought first nine

* Geo. C. Butz, in "Standard Cyclopedia of Horticulture."

† Proceedings of the twenty-first annual meeting of the A. C. S., 1912, pages 33-38.

acres of land in 1889, and in 1905 purchased a further twenty-four acres, each of these being on Indiana Ave., where he built four greenhouses. In 1911, at the time of his death, the firm had over 100,000 sq. ft. of glass, together with a retail establishment in La Fayette.

FREDERICK DORNER

Born Baden, Germany, 1837; died La Fayette, Ind., 1911. Has been called the "Father of the American Carnation." A most painstaking raiser of new improved varieties.

It was in 1888 that he became interested in experiments in the breeding of Carnations, and the first varieties he utilized were Silver Spray, Grace Wilder, E. G. Hill, Century, Buttercup, Heintz's White, Mangold, Mrs. Cleveland, Wm. Swayne, Surprise, Robert Craig, and a variety called Purdue. In the following three years he added the varieties Starlight, Portia, Garfield, Tidal Wave, Andalusia, Golden Gate, and Daybreak, which were all used in his work and show today in many of the later seedlings. His work continued uninterruptedly for twenty-one years and during this time he grew over 150,000 seedling Carnations. Of this 150,000 not more than 75 ever reached the market. The larger number of them went to the dump-heap, but we cannot say that their existence was in vain, for many of them were the ancestors of some of his best varieties of today.

Mr. Dorner always insisted upon a thorough test of each of his novelties, and would not disseminate one until he was thoroughly convinced that it was better than something already on the market, or that it might fill a

gap somewhere. The list of Mr. Dorner's varieties includes the following, and it will be seen that herein are very many of the most famous Carnations that have been in commerce. The list, however, is not an exhaustive one:

Christina Dorner	Uncle John	Alba
Tecumseh	Michigan	Senorita
Hoosier	Goldfinch	Mauvina
Mrs. Harrison	Dazzle	Bizarre
Indiana	Mrs. C. H. Duhme	The Belle
Ben Hur	Meteor	Neptune
Richmond	Bridesmaid	Lady Bountifu
Purdue	Mrs. G. M. Bradt	Eclipse
Spartan	Gold Nugget	Aureola
Mrs. Elizabeth Reynolds	Ceres	Fiancee
Mad. Diaz Albertini	White Cloud	White Perfection
Dr. Smart	Mary Wood	Red Chief
Blanche	G. H. Crane	Bonnie Maid
Wabash	Lorna	Winona
Wm. Scott	Morning Glory	Pink Delight
Western Pride	Dorothy Whitney	Scarlet Glow
The Stuart	Stella	White Wonder
Storm King	Sibyl	Gloriosa
E. A. Wood	Apollo	Rosette

One reason of his success was that he had an intimate knowledge of the varieties he worked with, and of the parentage of each of them. These facts suggested to him whether or not a certain variety would be the basis of a good flower in its offspring. After the first few years no foreign varieties were used at all, owing to the fact that these might have had ancestors with objectionable characters, which characters might show up in the progeny.

DORNER'S IDEAL CARNATION PLANT

Prof. Dorner records his father's ideal of what a good Carnation should be. "It was a plant that should have branches in all stages of development, and when planted in the bench should show the same number of flowers and buds during the entire year. The leaves of the plant were to be broader and shorter than those varieties that belong to the class known as croppers. The leaves were to have

a very strong bluish-green color, as this is the natural color of those Carnations that have strong constitutions. The stems were to be long and stiff enough to carry the flower. This did not necessarily mean that they were to hold the flower perfectly erect, as he preferred that the heads should bend just slightly toward the side and so prevent them from looking stiff. The flowers themselves were to have purity of color, were to have size, symmetrical form and fragrance, and were to have a non-splitting calyx." In regard to foliage, he always made it a rule never to use together two plants with heavy, coarse foliage and heavy stems. He preferred using a variety with fine foliage with the coarse foliage ones. While it is true that the coarse growing varieties give the largest flowers, they do not produce enough of them to make them good commercial varieties. To plant with the intermediate foliage is usually the best, giving more flowers of a good average size.

Mr. Dorner was the first florist in the Middle West to disbud his Carnations.

It is interesting to note that among the seedlings raised from Daybreak was White Cloud and Lorna, the next of the series, which was a seedling of White Cloud. From Lorna came The Belle, and from The Belle came White Perfection. White Wonder, the latest of the series, is a seedling of White Perfection.

Since the death of Frederick Dorner in 1911, the work of cross-breeding and growing Carnations by the F. Dorner & Sons Co., Lafayette, Ind., has been carried on by Theo. A. Dorner. The varieties sent out since 1911 include White Wonder, Gloriosa, Champion, Yellow Prince, Yellowstone, Pink Sensation and Good Cheer.

A THIRTY YEARS' SURVEY

The following most interesting account of the last thirty years of American Carnation History, written by Miss Sarah A. Hill, sister of Gurney Hill of the E. G. Hill Co., Richmond, Ind., splendidly epitomizes the subject, and will be read with pleasure equally by the old-timer and the beginner:

[When we began business in 1880, the Carnation was classed among "miscellaneous plants"; it had not yet become a specialty and was a "Pink," to all intents and purposes, to most florists and to nearly all buyers of flowers.

Up to 1885 the only varieties now remembered even by name are probably Grace Wilder, Hinze's White, La Purité (deep cerise), Mrs. Mangold, Pres. DeGraw and Portia.

In our catalogue for 1886, which has now become an antique, we open a Carnation section with the remark: "We depart from our alphabetic order to give Carnations a place next to Roses, where they belong." Then follows a list of new sorts, some fourteen in number, none of which, except Buttercup and Peter Henderson, wake a responsive chord of memory. In 1887, two of John Thorpe's seedlings, Columbia and E. G. Hill, together with the English variety, Pride of Penshurst, and the French sort, Mlle. Carle, were introduced as a "set" at 50c. each, and I can readily recall the impression made by the last named, for Mlle. Carle was supernaturally white, on a slender, erect stem, and every petal in place. We have nothing now of such perfectly chiseled form, nothing so dazzlingly white, but its lack of freedom took it out of commerce completely. Many a grower, and more laymen, fell under the spell of the Carnation from admiration of this lovely variety.

The year 1888 found Silver Spray and Mrs. Cleveland added to the list. Owing to its unusual freedom Silver Spray became quite well known and held a place for a few years, and in 1890 we find Tidal Wave being quite generally grown.

We have often wondered what developments some of these sorts might have made if handled under our present practical systems. We grew them in those pre-historic times often in houses running north and south, and they certainly were not tied up before it was absolutely necessary. I remember gazing over a bench of Tidal Wave in Midwinter and seeing a few dots of cerise nestled in the blue-grass and was surprised and pleased with the showing!

E. Gurney Hill

Born Rochdale, England, 1847. Came, with his parents, to America in 1851. A florist of international reputation, a notable raiser and introducer of Carnations, Chrysanthemums, Roses. Is president of the E. G. Hill Co., Richmond, Ind.

In 1891, by arrangement with Mr. Fred Dorner, we sent out two "sets" of Carnations, all his own seedlings. The first set were supposed to approach the ideal for commercial growing; the second set were sorts that would probably appeal to amateurs and for use in retail catalogues. In 1893 Edna Craig, a Dorner seedling, was sent out. It certainly was a lovely flower, a delicious shade of pink, very popular, but it was found far from profitable when the returns of the bench were footed up.

In 1894, Dorner himself distributed the fine white, Uncle John, and Dailledouze Bros. put Bouton d'Or on the

market, a nice yellow, but not a moneymaker. The year '96 saw us struggling with Jubilee, a brilliant scarlet raised by Mr. John Hartje, the best of its color, but it proved so subject to rust under the then known conditions of culture, that it came to be regarded as a pest rather than a prize-taker. In the same year (1897) came Flora Hill and Mrs. Bradt. These two sorts are still within the memory of the older growers and the following year the Dorners gave us White Cloud.

PETER FISHER'S LAWSON, ENCHANTRESS AND BEACON

In 1900, we disseminated Ethel Crocker, raised by Jno. H. Sievers, a lovely peach pink, which, however, absolutely refused to produce a good crop of flowers before Spring opened up. Quite a number of florists in love with its color, held on to it for a few seasons for its Summer bloom, but it shortly fell by the wayside. That year, too, became memorable in the forward march of the Carnation by giving us Mrs. Thos. Lawson and The Marquis. It is a wonder that Mr. Peter Fisher did not collapse with nervous prostration before the season was over. Everybody wanted the wonderful and strikingly advertised Lawson; no trouble about getting orders, the trouble was in getting the rooted cuttings, for Carnation propagation was not yet a science in those days. I think that our order was completed late in May, after we had answered hundreds of inquiries as to the delay, from florists who had placed their orders with us for moderate quantities of this variety. However, after all the anxieties and vexations of the Lawson introduction, the Carnation had received a great boost in its upward climb, and people were delighted with the beautiful form and the delightful color. It was at once fashionable and popular.

By 1901, Prosperity was given to the trade—a really sensational kind, and absolutely unique; it was in great demand. In 1903 Adonis and Enchantress were distributed. Mr. Fisher found a heavy demand for this latter famous seedling, and had little trouble getting up the enormous quantity required. And Adonis! —anyone having literary talents might have written a book about this glorious crimson scarlet of Witterstaetter's. Robt. Craig and E. G. Hill completely lost their heads at sight of it: strong, upright stems, carrying velvety flowers of the most intense shade. They each bought a third interest in it, and the triangular combination set about introducing the young Adonis to the American trade, who were ready to receive it with open arms. It was awarded all sorts of honors, and the press gave it quite extravagant notices. It was not till a second season that its lack of texture became apparent, and to the intense disappointment of lovers of the Carnation, it went down like the fall of a rocket.

PETER FISHER

Born at Dowelly, Perthshire, Scotland, in 1857. Raiser of some of the most famous and most successful varieties of American commercial Carnations. He is still busy at work at Ellis, Mass.

Flora Hill was still the most widely grown white, but everybody wanted a better one, with stiffer stems early in the season. Lady Bountiful was tried with interest, and was shortly superseded, in 1906, by White Perfection, one of the loveliest and most perfectly formed varieties in existence, which was followed, in 1907, by White

Enchantress, a sport from the light pink parent, and as Rose-pink appeared about the same time, the three Enchantresses took the course and are still in the running, though they are finally losing in stride, especially in the estimation of the more careful and exacting growers.

Along with White Enchantress (1907) came Beacon, the freest Carnation ever grown, with many faults at times, glorious at others, indispensable, and now we are all watching to see what Champion will do.

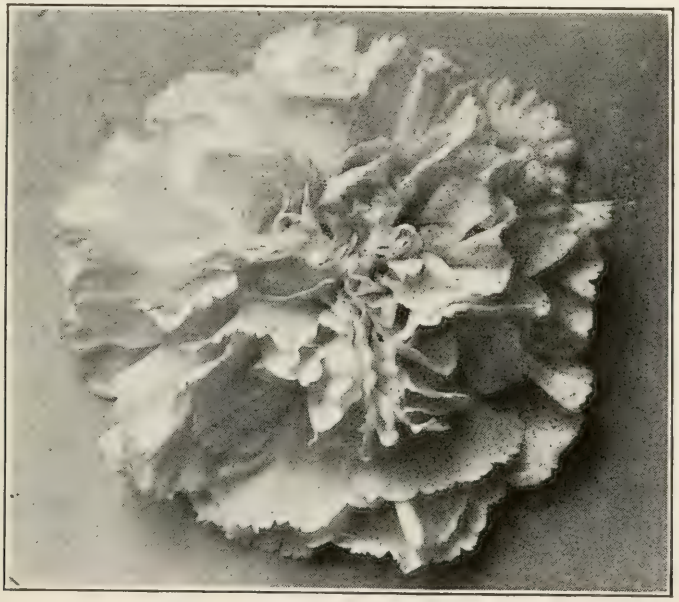
Bloom of White Perfection (Somewhat Reduced)

THE PRESENT DAY

The year 1909 brought May Day, which is still grown and valued in England, and Pink Delight, probably Dorner's very best Carnation. It has taken nearly six years to attain and hold its place at the very top of the light pink section, and is still making converts, as it is being shown to

have more lasting texture than any other Carnation of any color, and while a big Enchantress makes a bigger blur of color, its lack of endurance and its tendency to go to sleep the day after it is cut have alienated the affections of many a Carnation lover who has not yet "been shown" the staying qualities of a well grown Pink Delight.

Since 1910, the most notable additions have been Mrs. C. W. Ward, the queen in its class; White Wonder, our



Bloom of White Enchantress (Slightly Reduced)

best all-round white, having superior keeping qualities to any other white, probably; while Matchless and Enchantress Supreme seem likely to win golden spurs. Benora is our best variegated, Yellow Prince our best yellow, and Pocahontas a profitable crimson.

These estimates of values are not made dogmatically,

and are open to argument before the court, though we believe that the majority of Carnation growers will coincide

Mrs. C. W. Ward, the Most Popular Deep Pink

with the writer, except for a goodly number who are still absolutely loyal to Enchantress and White Enchantress.

Among the large number of varieties that are unmentioned, and that "also ran," there have been some beauties of which great things had been hoped, which have been admired and valued, which have had their short day and disappeared; just as numbers of one's old schoolmates gave great promise in the morning of life, only to fall later into obscurity.

Every Carnation that has been an advance over existing sorts has been a thin stepping-stone toward that perfection to which we aspire, and those of us who have taken them up and tried them have been bearing only our share of building up the secure monument of the People's Flower.

CHARLES WILLIS WARD

Born on the site of the present city of Mt. Pleasant, Michigan, in 1857. A very careful raiser of Carnations for many years at Queens, L. I., and formerly a great force in the Carnation world. His best introduction was undoubtedly Mrs. C. W. Ward.

Although the Carnation has not received so much attention from floral artists as the Rose, there are still some exquisite paintings of beautiful blooms insome of the specialistic publications of the middle and latter half of last century. The Carnation has also a remarkable literature of its own. More than eighty books have been published dealing with it, the names of which have been compiled by Mr. C. Harman Payne of London, Eng., and published in his "Florists' Bibliography," a work that every student of floral literature ought to possess. This notable and voluminous list, which follows, speaks eloquently of the wide-

spread interest that has for so long existed in regard to Carnations:

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Duisberg, 1788.
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With plain instructions for its cultivation and management. London (N.D.).
Brotherston, R. P.
The Book of the Carnation. London, 1904.
Brown, A. K.
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Cook, Arthur J.
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Cook, E. T.
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Carnations and Pinks. London and Edinburgh, 1911.
Cook, Laurence J.
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D'Ardene, Le Pere.
Traité des Œillets, par l'auteur du traité des renoncules. Avignon, 1762.
Deutliche Darstellung der Karakteristik, und des Systems der Garten Nelken, zum Gebrauch fur alle Nelkenliebhaber bei und nach den Flor. Leipsic, 1808.
Dodwell, E. S.
The Carnation and Picotee: Their History, Properties, and Management, with a descriptive list of the best varieties in cultivation. Derby, 1886.
Douglas, James.
Carnations. London. (N.D.)
Dupuis.
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Ettler, J. C.
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Felton, R. F.
A Short Treatise on Carnation Growing for Pleasure and Profit. London (N.D.).
Fraser, John.
Select Carnations, Picotees and Pinks: The History and Cultivation of all Sections. London, 1907.
Freund, H. D.
Die Cultur der Garten Nelke. Quedlingburg and Leipsic, 1840.
Fritsch, C. J. W.
Die Garten Nelke, ihre Erziehung, Pflege und Vermehrung. Arnstadt, 1875.
Goube.
Nouveau traité des Œillets. Cambrai, 1769.
Grubert, Rich.
Remont-Nelken und Amerikanische Nelken. Berlin (N.D.).
Grundliche Anweisung zur Nelkenzucht.
Frankfort on the Main, 1806.
Guillot, Auguste.
Culture pratique de l'Œillet remontant, race lyonnaise à tige de fer. Geneva, 1903.
Henne, A. S. L.
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Hertel.
Kurze Geschichte der Nelken nebst einem Verzeichniss von denen, die zu Schwerin bei ihm zu bekommen sind. Schwerin, 1812.

Hibberd, Shirley.
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Hogg, Thomas.
A Concise and Practical Treatise on the Growth and Culture of the Carnation, Pink, Auricula, Polyanthus, Ranunculus, Tulip, and other Flowers. London, 1820.

Huelle, Ger.
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Geschichte der Garten Nelke. Vienna, 1913.

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Leid, Wilhelm.
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Ponsort, Baron De.
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Ravenscroft, B. C.
Carnation Culture for Amateurs, containing full instructions for the Culture of Carnations of all classes in the open ground and in pots. London, 1906.
Reider, Jacob Ernst Von.
Die Beschreibung aller bekannten, sowie der neuesten noch sehr seltenen prachtvollen Arten von Nelken, Aurikeln und Primeln und deren verbesserte Kultur. Leipsic, 1835.
Roessig, Karl Gott.
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Von Behr, C. A. L.
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PINK SENSATION, ONE OF THE BRIGHTEST, AS WELL AS ONE OF THE BEST SHIPPERS

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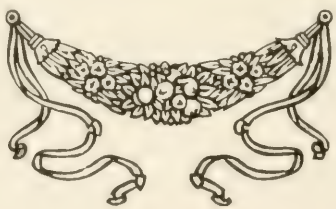
Here we can now terminate this Carnation chronology, but not without expressing the hope that it will be our privilege and pleasure to continue the history at some later date. In it is outlined in sketch the garlanded trail of ages of the Cloveworts, but when the true, complete, authoritative calendar and history of all the branches of the Carnation family comes to be written, remember that it will have to comprise the full story of the old European Picotees, the famous flaked Carnations of Ray, Miller, Hogg, and later growers; the history of the superb selfs raised by Martin Smith and Jas. Douglas, the story likewise of the Malmaisons and even of the floriferous Marguerite section, short though the latter may be. We of today seem so much in a hurry that we scarcely stop to take due notice of the noble flowers we have, or to paint a picture of them for posterity, as some of the florists of the 50's of last century did, "that golden period of floriculture," as Richard Dean used to call it. Our flowers and plants are as part of us; they are certainly divine flowers—God's messengers. We should prize them fully.



CHAPTER III

Profits on Carnations

In a discussion of this question, as indeed of all that pertains to the cost of production and profit on flowering plants and nursery crops, one finds much difficulty in arriving at reliable results. Many growers keep no detailed record of their expenses and returns.

Circumstances, localities, soils, and such like have a material bearing on the matter. If a grower is situated within the radius or effects of the smoke and fumes of factory chimneys he is at a disadvantage compared to the man in a sunny situation, with a pure atmosphere. Much depends, also, on cost of fuel, distance from market, scarcity of labor, or the opposite. But the Carnation grower has conditions much more under his control than the man who grows outdoor crops. He can regulate his temperature, has the watering of the stock completely in hand, and otherwise is master of the situation. Nevertheless, the man in Long Island, N. Y., or Washington, D. C., has an advantage over the man in Buffalo, Toronto, Toledo or Spokane, in the matter of sunshine, as can be proved by the records of the meteorologists. (See sunshine records on page 252.) This is a far more important matter than has been thought in times past.

The type of house is a matter deserving the closest and most careful consideration in connection with the successful results from Carnation growing, and in this

connection the reader is referred to the chapter discussing greenhouses. There it will be seen that the large, airy, light, clean and roomy modern iron house is the best, and the one most likely to insure successful results. Nearness to a supply of good fuel may make considerable difference on the expenditure side of the account, yet, as we know, florists in some of the Southern States, where the coal bill is not a serious item, regularly ship in a large proportion of their cut flowers from the Chicago growers, who, of course, have to depend entirely on boiler heat. The Southerners have still largely to wake up to their opportunities.

While the overhead charges vary considerably, owing to various economies practicable by the grower in a large way of business in a good location, yet in the case of the majority of smaller growers, especially those in the medium sized and smaller cities, the general run of overhead charges is pretty nearly alike.

Then comes in the skill of the cultivator. It is well known that growers almost contiguous to one another often produce blooms of distinctly different quality, even when they are the same varieties. Skill, experience, and knowledge must, therefore, be put down as a very considerable factor in this question of success and profit.

One of the most telling factors in the whole situation is the variety or varieties that are grown. If a plant is not floriferous, healthy, and otherwise of merit, space is being occupied unremuneratively or not as profitably as it could be.

In the first place, the grower has to consider the proportion of plants in any given color, that are to be grown. From an analysis of various letters sent to the leading growers throughout the country it was found on a balance

of opinion that the majority favored planting in the following proportions:

White Carnations	36%
Light Pink	35%
Dark Pink	17%
Scarlet	12%

This is a valuable index to the beginner in commercial Carnation cultivation. Possibly it would be wiser, in view of the increasing demand for white Carnations for Mother's Day each year (second Sunday in May), to plant more of these.

At the same time, so close has been the study of the characteristics of varieties by some growers, that they have eliminated all but one or two at the most. These they specialize in, and grow them better than any other competitor can.

The least profitable limit at which a Carnation plant can be grown varies according to the quality and character of the blooms, but sixteen flowers per plant is a good middle figure, and indeed the consensus of opinions collected by us showed that 18½ blooms per plant is frequently expected, and to be lucrative the wholesale selling price should be 3⅛c. per bloom. Unfortunately, half this price has frequently to be accepted nowadays; but, on the whole, the yearly average runs at 2c. per bloom at wholesale. Some growers dispose of their blooms the year round at a level contract price arranged on this basis. In addition, there is the sale (if any) of cuttings or plants to be taken into the reckoning as well as the cut blooms, and of any other stock or side or catch crop that may be grown. The standard price of cuttings of novelties is $12 per 100, $100 per 1000; while the price of other varieties varies according to how recently they may have been introduced to commerce. In the Spring of 1915 the prices for Champion,

Matchless and Princess Dagmar were $6 per 100, $50 per 1000; for Pink Delight and Yellow Prince, $5 per 100; while for all the standard varieties the ruling market price for cuttings was $3 per 100.

In a paper read at the Cleveland meeting of the American Carnation Society in 1914, Joseph H. Hill of the E. G. Hill Co., Richmond, Ind., submitted data showing the following yield of blooms per plant from July, 1912, to July, 1913:

Beacon	14.2	perfect;	2.4 split, but salable.
Benora	10.5	"	and a wealth of cuttings.
Enchantress	14.6	"	2.8 split, but salable.
Gloriosa	13.2	"	Can be planted closer than heavier growing varieties.
Mrs. C. W. Ward	12.3	"	1.2 split; fetches top prices when well grown.
Pink Delight	13.	"	Can be planted closer than heavier growing varieties.
Rosette	14.	"	
White Perfection	13.	"	
White Wonder	16.6	"	1.1 split, but salable.

The average yield of these and other varieties tested by Mr. Hill was a fraction under fifteen flowers per plant, plus an average of two cuttings per plant. Each plant occupied an average of ¾ sq. ft. of the entire surface covered by glass.

The cost of production per plant was estimated as follows:

Value of plant at benching	6c.
Proportionate cost of fuel in Winter	2c.
Labor	10c.
Interest on investment	3c.
Proportionate charge for soil, fertilizers, shipping	2c.
	23c.

Thus, every plant must earn rather over 23 cents before any profit materializes to the grower. At 15 blooms per plant, and these selling at an average of 2c. each, this

would show 7c. profit. According to the quotations on the Chicago market this price is well maintained on the average of the year, but the yearly average at New York is only some $1.55 per hundred blooms, so that an average of 18 blooms per plant would be necessary in order to realize even a very moderate income from an establishment of 20,000 sq. ft., or else the cost of production would have to be lowered. This assumes, of course, that Carnations alone are grown, though there is always the probability of adding a few small side lines or of getting in a rush crop between the end of May and August. Such crop may be of Asters, Tomatoes, Mignonette or small Ferns.

If we take the quotations on the New York market, where prices are low rather than high, over the Winter and Spring period, from November to May, inclusive, a better showing is made, the average prices for all grades being $1.95 per 100, which is approximately the 2c. rate and should show a net profit of from $1200 to $1400 on 20,000 plants for the period. The average wholesale prices in 1914 in Chicago and New York per 100 blooms were as follows:

CARNATIONS

	Standard		Fancy	
	Chicago	New York	Chicago	New York
January	$1.75-2.50	$2.00-2.65	$3.30-4.25	$2.75-3.75
February	1.65-2.36	1.35-2.35	3.00-4.00	2.35-3.50
March	1.00-1.50	1.15-1.65	2.00-3.00	1.85-2.50
April	2.00-2.50	1.20-1.90	3.50-4.00	1.90-2.65
May	2.00-3.00	.75-1.00	4.00-5.00	1.65-2.00
June	.85-1.25	.35- .70	1.65-2.85	.70-1.15
July	1.00-1.50	.50- .87	2.00	1.00-1.50
August	.75-1.00	.55- .95	1.50-2.00	1.00-1.50
September	.75-1.10	.75-1.30	1.50	.....
October	.85-1.25	.85-1.00	1.00-1.65	1.00-1.65
November	1.25-2.25	1.20-1.65	2.40-3.35	1.65-2.35
December	1.50-2.00	1.00-1.50	3.00	1.50-2.00

A range of six houses, 30 ft. x 100 ft., will house 20,000 plants in benches, allowing ¾ sq. ft. per plant, and two men will take care of this number successfully. On a cost basis of 23c. per plant to cover all costs—labor, fuel, interest on investment, value of plant, freight charges, etc.—the grand total of cost is $4600, and at a minimum average of receipts of 30c. per sq. ft. of glass, we get the sum of $6345 to offset this, the difference to the good being $1745. The proprietor who does not recoup himself to this extent had better try some other business, or hand over the management to someone more capable than himself.

A successful and careful grower for the Boston market says he finds that if he can cut fifteen blooms per plant, planted 9 in. x 8 in., or 10 in. x 8 in., from October 1 to May 31, he is satisfied, and returns from these in that market are about $1200 per 2000 ft. of bench space; that is, 60c. per ft., gross sales. As the New York market is lower than the Boston market the gross income in the case of a New York grower would probably average about 50c. per sq. ft. of bench space, which would afford a reasonable income.

These figures may appear sufficiently satisfactory, and on the face of them they are, but when one considers the risks a grower runs of losses by storms, diseases in his plants, bad markets owing to climatic changes at a critical period, and when we consider how prices have declined in recent times owing to over production and competition, a man must think long and carefully before entering the ranks of commercial Carnation growers in these days. He should have good business ability and be otherwise well fortified. Then he may succeed.

CHAPTER IV

Packing, Shipping and Business Matters

There is room for a better understanding between the wholesale florists and the growers on the matter of the sale of blooms. A speaker at a recent floricultural meeting well expressed the situation when he said: "It is unfortunate that there is so much distrust still lingering between these branches of our business. There should be more co-operation and we must remember that we are all mutually dependent on one another. If the retailer thinks he is being robbed when asked $8 or $10 a hundred for Carnations at Christmas, let him remember the grower probably thinks the same thing when he sees the consumer paying 75c. a dozen, and he is receiving $1.50 or $2 a hundred. Moreover, the retailer can place the responsibility for the high prices on the grower, while the latter has no one to come back at."

In regard to the demand for, and sale of, flowers the same speaker remarked that "during the past few years we have heard many complaints that Carnations have been giving poor satisfaction, and many retail stores have ceased to push them at all. We cannot blame the retailer if he does not feel kindly toward the Carnation if he finds his stock, that was apparently fresh when he bought it, unsalable at the end of 24 hours. Nor is the customer who purchases them, and finds them asleep the next morning, likely to go back for more for some time."

Remedies have been widely suggested. It is often hinted that the flowers are left to open too fully before being cut. "The longer they stay on the plants the shorter will be their life on the purchaser's table." Flowers that are cut when two-thirds open keep better and give greater satisfaction. Old or pickled stock will be of no value in a living room with its dry atmosphere at a temperature of between 70 deg. and 80 deg. Careful grading of stock helps to make it more attractive for sale, and it is felt by many growers that more direct transactions between themselves and the retailers should be the rule. Better methods for caring for surpluses are urgently needed. Jumping stock from 50c. and 75c. per dozen to $1 or $1.20 looks to the buyers like a skinning game, and is a practice that many growers would like to see checked.

Back in 1892, at the American Carnation Society's annual meeting, C. W. Ward expressed himself in regard to handling cut flower stock, and on general business methods, in very decided terms as follows:

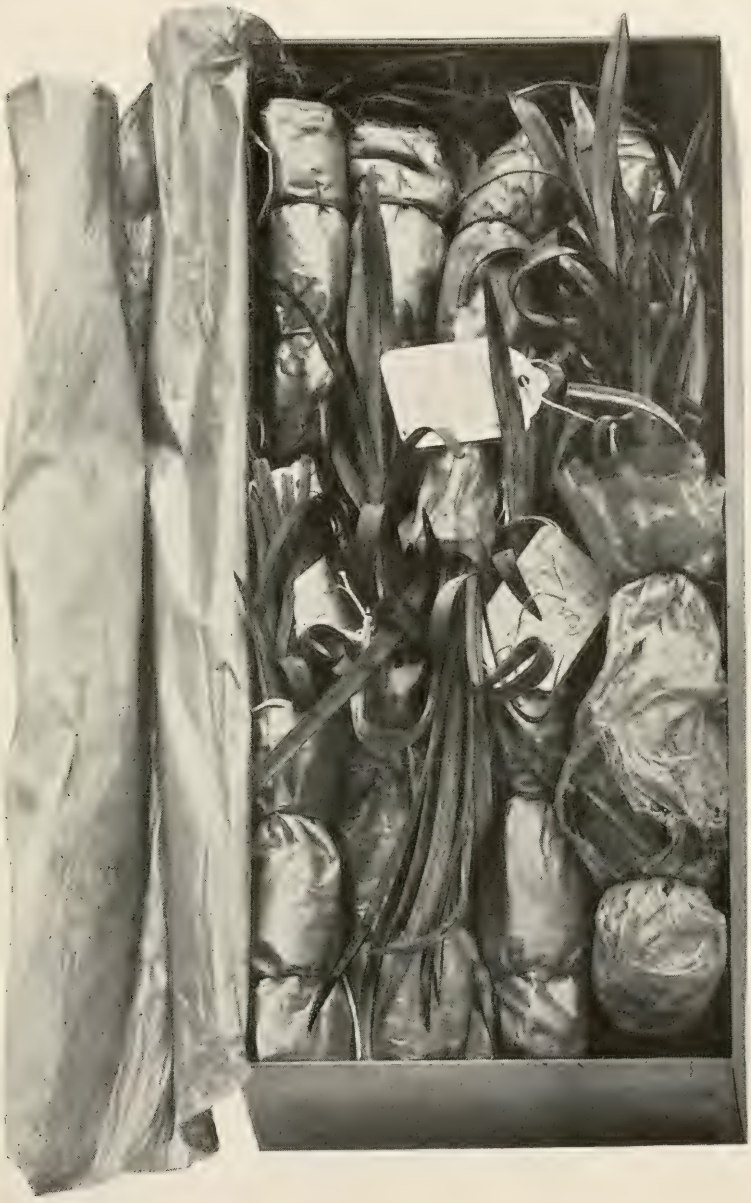
"The first business maxim should be honesty and fair dealing; the second, to conduct our business so that it should be successful and profitable. While there are no set rules nor rigid lines upon which business can be conducted, there are certain general principles which may be universally applied. You should not undertake to do more business than you can properly oversee and care for yourself, nor should you sell your wares below cost of production; neither should you make prices upon an article without ascertaining what it costs to produce it. You should never engage in an injudicious cutting of prices below market values in the hope of increasing your business or getting an undue advantage over your neighbor. The most foolish thing a grower or dealer can do is to attempt

GORGEOUS, DARK PINK, WITH 4 FT. STEMS. FINE FOR SPRING

to run out his competitor by selling goods below cost. This, with the improper extension of credits, has ruined more business houses than any other cause.

"Treat your customers fairly and liberally. When shipping your customers an invoice of flowers or plants, imagine yourself in his place and what you would think if you should receive the same at the same price you are receiving for them and packed in the same manner as you are packing them. By keeping this in mind, and treating them as you would wish to be treated, you will retain your trade as well as the goodwill of your customers. The best way to retain your customers' goodwill is always to send first-class goods so packed that they will arrive in fine condition.

"Aim to produce a high grade article and sell it at a fair price and a fair profit. Remember that in growing plants and flowers there is always plenty of room at the top, while the lower ranks are always crowded. In growing cut flowers for market, aim to send fine, long-stemmed blooms neatly bunched, with some foliage in the bunch. In bunching, tie the stems close to the butts so that the flowers will fall gracefully apart when the bunch is held up. In packing flowers, wrap the butts of the stems in damp sphagnum moss and wind soft paper around the moss, packing the bunches upon soft paper cushions so that the flowers may not bruise. Use clean, neat boxes to pack in. The neater your flowers open out on the market the quicker they will sell, and if your flowers open up uniformly fresh and in attractive shape you will make a reputation for superior stock and eventually get the highest market prices. Try to send a fair quantity of first class stock upon the market every day. Do not suddenly flood your commission man with a large quantity of perishable



BOX OF ROOTED CARNATION CUTTINGS VERY CAREFULLY PACKED

The roots are bound in damp moss, rolled in wax paper, fastened with elastic bands, and have more wax paper (shown rolled back) all over and around them.

flowers and then blame him because he does not sell all at high market quotations. Do not disappoint your customers; convince them that they can rely upon you and that you rely upon them.

"Treat your commission man fairly. Do not censure him unless you are sure he deserves it. Give him credit for the good he does as well as for the bad you think he does. By so doing you will gain his respect and goodwill if he is honest, and you should deal only with such as are honest. In selecting your commission man watch his habits carefully. If he is economical and careful about his living and business expenses you can feel reasonably safe in dealing with him; but if he is reckless and extravagant in his expenses, keeps fast company, gambles and follows the betting fraternity, be very careful in your dealings with him, as sooner or later these elements are sure to ruin him, and you will eventually lose thereby."

The manner of handling cut blooms, as adopted by most of the larger growers is as follows:*

The cutting of the flowers must be attended to with considerable judgment as regards the weather. If the weather is very cold the flower should be allowed to open a little more than usual, as if cut too close in very cold weather they soon go to sleep. Again, if there is a warm wave, with lots of moisture in the atmosphere, the flowers will be soft, and must be cut pretty close; also, during these warm spells the flowers should be kept in a little cooler temperature than usual to make the blooms as firm as possible. After the flowers are cut and tied in bunches of twenty-five each, they should be placed in water as soon as possible. This is best accomplished by having pails of

*C. L. Washburn, before Amer. Carnation Soc. at Chicago. 1905.

fresh water standing handy to the benches, so that as soon as a bunch is tied up it can be placed in the water at once. This is very necessary, as it helps prolong the life of the flower. If the blooms are left out of water until the cutting is all finished, a number of them will have wilted a little and the sap in the stem hardened up to such an extent that the flower will not suck up water freely.

After the cutting and bunching are finished the flowers should be placed in water in a closet or room where the temperature remains steady at about 55 deg., and where no drafts of air will strike them. When packing to send them to the commission man or wholesale store, use a few sheets of newspaper between each layer of bunches and keep the ends of the stems from touching any of the flowers. Two layers of bunches are enough to put in any package, as too many heads get broken when packed in too solid. The wholesale or commission house should put the flowers in water as soon as received.

Now for short distances: Where the flowers can be shipped on trains that will arrive early enough for the flowers to be delivered that same day, the stock sent is usually that cut the night before; but for flowers that will have to remain packed in the boxes over night and for all long-distance shipments, the stock taken is always cut in the morning, and after standing in water for three to six hours, is sent into the market and shipped away the same day. The old idea that a Carnation keeps best if allowed to stand in water eighteen to twenty-four hours before sending into market has been disproved by actual experience, and of the Carnation blooms received by the wholesale growers at least two-thirds the stock is cut in the morning and shipped in to their wholesale stores in the early afternoon to send away the same day. These

flowers will arrive in better shape and last longer every time than if cut the day before. After Carnations have been kept eighteen or twenty hours in water they seem to get kind of soggy and do not ship well.

Blooms of Highest Quality Packed with the Utmost Care, as Described in the Text

The boxes used for shipping Carnations are made of thin wood, $\frac{1}{2}$ in. ends and $\frac{1}{4}$ in. tops, bottoms and sides, with two $\frac{1}{2}$ in. cleats to fasten the stems down and hold the ice securely. These boxes are usually 12 in. wide and 4 in. to 8 in. deep, and 36 in. to 46 in. long. The boxes

may appear too long at first, but they are better too long than too short. Line the boxes first with four to eight thicknesses of newspapers, depending on the weather. Then a single thickness of soft wax paper all around. Commence and put in a row of Carnations, usually about six flowers to a row, and between each row of heads place a strip of wax paper about 3 in. wide and as long as the box is wide; about five rows of flowers in each end will constitute a layer, and between each layer place a sheet of wax paper the width of the box and long enough to cover all the heads in that layer; keep on until the box is completed.

It will be found that with the extra long stems now being grown four or five rows in each end of the box will be all that can be put in a layer, as by that time the stems will be within 6 in. of the opposite row of flower heads. The number of layers of flowers should not go over four or six, which will allow from 200 to 300 Carnations in one box. In the center of the box where the stems meet there should be placed at least eight or ten thicknesses of well saturated newspapers. These newspapers should be kept in a pail of water so that they will have had absorbed all the water they possibly can before being placed on the stems. After putting this wet paper on the stems, place the two cleats on and fasten them down securely with nails. Be careful in placing the cleats to put them only on the double rows of stems and not beyond, and also see there is plenty of wet newspapers under them, so there will be no danger of breaking the stems by pushing the cleats too far down.

The subject of icing a box is a debatable point, but for long-distance shipments our experience is that a small piece of ice well wrapped with newspapers helps to preserve the flowers from heat; and also keeps the newspapers over

the stems moist. For varieties that have brittle stems, care must be taken not to fasten the cleats down too tight, or too near the neck of the flower, or the stems will be broken in handling the package. It is also well to put a few sheets of tissue paper well crumpled up between the cleats and the flower heads. This will absorb any damp, cold air from the ice and will also serve as a cushion to protect the flowers from shaking up and down in the box by rough handling.

In order to dispose of our product to advantage, it is absolutely necessary to continue to improve our methods of handling Carnations intended for shipment. They must be grown stronger, more air given and greater care taken in feeding. The effect of the warm Spring rains must be overcome in some way, as during such periods it is almost impossible to ship Carnations any distance and not have them arrive fast asleep.

All the little details of cutting, placing in water and shipping should be attended to with the greatest fidelity, and as we improve our methods of handling and our varieties of stock, so shall we increase our volume of business. The advisability of devoting a certain amount of glass to growing plants for Spring and early Summer blooming is a point that should be considered. There are some varieties that are at their best during these periods, and there is no doubt that Carnations always ship best when in full crop. If the creators of new varieties would give more attention to the shipping qualities of their new flowers instead of trying to increase the size so much, they would be working along lines that are susceptible of considerable improvement. No matter how large a flower, or how fragrant or brilliantly colored it is, if it will not ship well it cannot be grown extensively.

ROSETTE, GOOD IN MIDWINTER; A STEADY BLOOMER

CHAPTER V

General Cultural Calendar

January.—The greater part of the cuttings are taken this month, which is generally considered the best time. In regard to the flowering plants, apply light dressings of sheep manure, or give tankage in a weak form at monthly intervals. Keep the plants well supported and disbudded, and do not omit spraying regularly each week.

February.—The cuttings now rooted may be lifted from the sand and potted up, or may be placed in the benches. Continue putting in later cuttings. Syringe the flowering plants with salt water as an antidote to red spider, and take every opportunity of ventilating the houses. Marguerite and other annual Carnations may be sown.

March.—The propagating of cuttings may still be continued, but ought to finish up before the end of the month. Shift on any young stock that may require it. Continue to spray the flowering stock a little oftener, and give air freely whenever the weather is mild and bright. Seed of perpetual Carnations may be sown now.

April.—A thin mulch may be given over the benches of the flowering plants, and do not neglect to water them well. The light colored flowers, particularly pinks, are benefited by a light shading over the glass. The larger

of the young plants may be planted in the field this month, usually after the 15th.

MAY.—Finish planting out of doors as early as possible, and keep up the cultivation and hoeing of the soil between the rows. Continue disbudding indoor stock for flowering.

JUNE.—The worn-out crops may be thrown out this month, while those for flowering may continue to be shaded. Keep up the cultivation of the soil in the field, and pinch the shoots of those plants that begin to run up. Less water may be given to the plants in the field so as to firm them up for the benching time.

JULY.—By the end of the month benching will be in progress, therefore do all possible to develop sturdy stock. At the same time do not allow the plants to get hard and wiry. Cultivate the soil, and keep all clean, healthy and steadily growing. Houses and benches must be thoroughly cleaned and in readiness. Sow Grenadin varieties. Layer Border varieties and Malmaisons.

AUGUST.—Early in this month the benching must be concluded, according to directions given elsewhere. Keep the surface of the soil stirred between the plants after planting, and top back the leading shoots, if early blooms are not wanted. Pot up layers and seedlings.

SEPTEMBER.—Spray regularly, and keep disbudding. See that the supports are placed in position in good time.

OCTOBER.—The plants are growing fast, and sending up flower stems, therefore require extra supports all the time. Spray regularly, and continue free ventilation, leaving a little on even on cool nights. Firing will now be necessary occasionally. Afford a light mulch of sheep manure over the soil. An occasional light dusting of lime

is beneficial at this time, or whenever the plants seem to require stiffening up.

NOVEMBER.—Continue spraying. Be careful with the ventilating. Keep the soil surface scratched. Disbud where necessary, and attend to the staking. The field for the Summer crop may be plowed now, and cross breeding may be undertaken if that is practised. Some of the slow growing varieties may be propagated by cuttings.

DECEMBER.—Other cuttings may be taken this month, and the work as outlined in the last month continued carefully.

ROUTINE OF CULTIVATION

PROPAGATION

The old method of propagating by layering is not practised in this country. The first thing is to choose cuttings from good, sound, healthy plants. A little bottom heat, while not necessary, is still desirable, as it hastens the rooting and avoids loss from disease or decay.

A bench situated at the back of any ¾ span roofed greenhouse, facing north, is excellent. The benches for the cuttings should be 4 in. to 6 in. deep, and ought to be thoroughly clean before being filled. A good coat of limewash is advisable, and for drainage over the bottom a little clean straw or sphagnum moss can be laid over the seams or holes. Use clean, sharp sand, neither too fine nor too coarse; very fine sand packs too close, while coarse sand doesn't pack sufficiently. Pound this well with a brick to make it firm, then the bench is ready to receive the cuttings.

As to which type of cutting is best is an open question.

Many prefer cuttings from the flowering stem, as these make better plants than cuttings from the tip. The best are taken neither too high nor too low on the flowering stem. A short flowering shoot is ideal. A cutting that is stretched too much, or long and sappy, is poor, also one very low down on the stem, which very frequently is too hardy or woody to root freely or well. Many large growers, however, rely upon cut back plants to yield cuttings, as they cannot get sufficient in any other way.

Five to ten cuttings may be taken from one plant, but always leave a few growths at the base for the next crop of flowers. All trimming that is to be done should be with a good, sharp knife. When necessary to cut the bottom of the cutting, do so just below a joint, and do it clean. Cuttings may be taken any time from December to March, and will root in three to four weeks. Good cuttings should not be more than 3½ in. long and 3 in. would even be better. Place them in the sand ½ in. to 1 in. apart in rows, 1½ in. deep and 2 in. between the rows, each variety being labeled to avoid danger of mixing.

When putting the cuttings in the sand, use a lath as a guide for the rows; lay the lath on the sand, hold in position with the left hand, and with a piece of good hard wood, shaped like a knife, draw a furrow across the bench in which you lay your cutting with the left hand, pressing it firm with the forefinger of the right, and so on until the row is finished. If the sand is pressed firm at the top of the cuttings and not at the bottom, they will be sure to fail.

There are a few things to remember in the management of the cutting bench, as the temperature, moisture, shading and airing. The cuttings will root nicely in a house with a temperature of 50 to 55 deg. Always keep the sand

damp, but not soggy. Syringe the cuttings overhead as often as the weather permits. If the sun strikes the house, shield the bench either by using old newspapers laid over

TYPES OF CUTTINGS

1, best type; 2, cutting with hard base, difficult to root; 3, cutting too extended; 4, cutting taken too far up the stem; 5, spindly cutting with hard heel.

the cuttings, or by hanging cloth above them, the latter being perhaps better, as it gives the cuttings the full benefit of the air. Give Nature a chance to heal up the

wound and form roots, whether you have a 10 ft. propagating bench and use paper, cheese cloth, muslin or frames of whitewashed glass, or the latest design of an especially

TYPES OF CUTTINGS

1, rooted cutting, once stopped, ready for the field; 2, an ideal cutting trimmed ready for the sand; 3, poor cutting with hard heel; 4, cutting rooted after three weeks in the sand

constructed house for propagating purposes. The growth on all of the stock plants we make use of for propagating purposes in March is far softer then than it was two months

before, therefore Carnation cuttings then are more subject to suffer if exposed to full sunlight. Whether you can root them without shading or not, the proper way is to apply shade, and if possible arrange it so that this shade can be removed partly or entirely on dark or cloudy days. The sooner all shade is removed when you notice actual root growth the better, for a rooting cutting of any plant requiring full sunlight will go back if allowed to remain in a shady position.

THE MAIN PROPAGATING

Only by everlastingly keeping up the selection of the very best material for cuttings can we expect to prevent our stock of Carnations, or for that matter any other plants, from running down. No matter how short you may be of a certain sort, never take a cutting from a diseased plant or one that does not just look the way it ought to. Let the sand the cuttings go into be fresh and clean, and the bench itself should be in a clean condition, as well as the house. Never was there a Carnation plant grown for any length of time successfully in a dirty house.

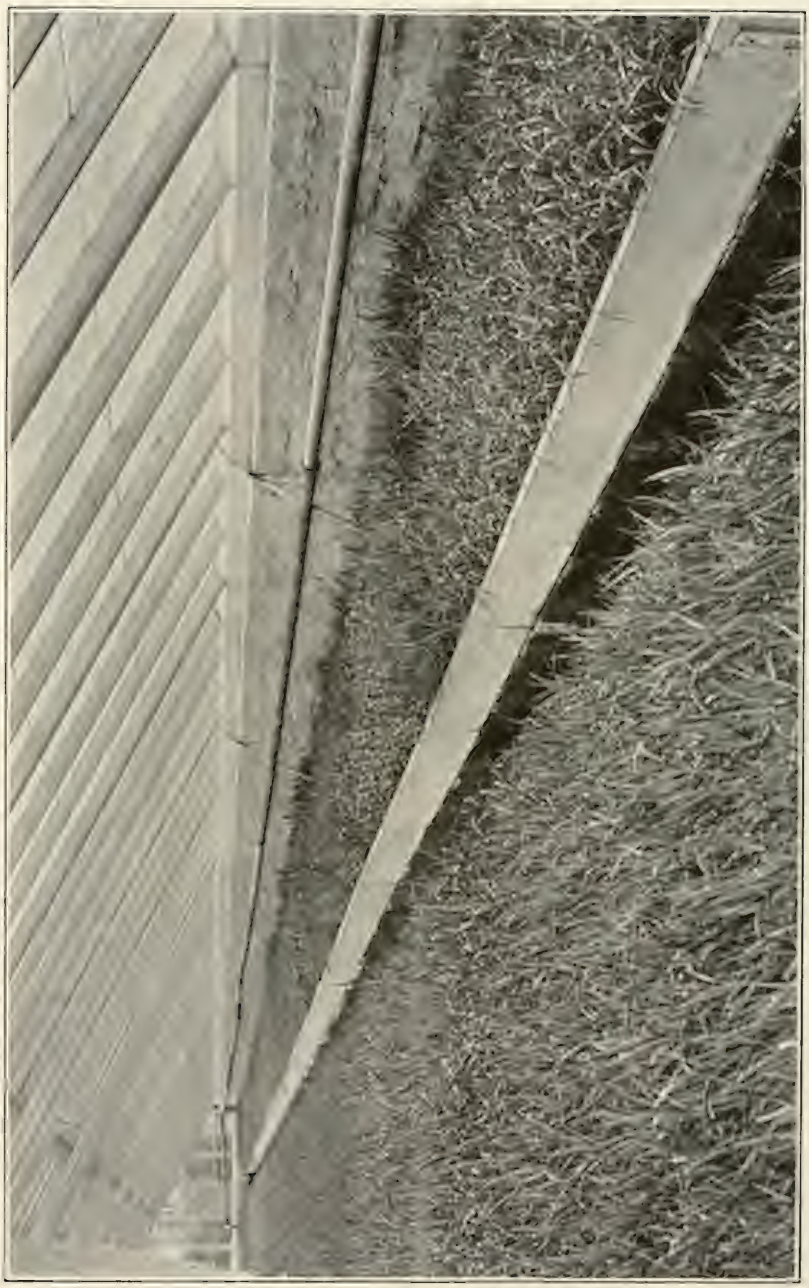
While one can even root Carnation cuttings up to April, the great majority of growers prefer January and February as the months to root their main batch. At this time excellent small side shoots of the flowering wood can be had which really do not need to come in contact with a knife in order to get them ready for the sand, and with just a little bottom heat over 95 per cent. will root. Toward the end of January the little plants are ready for 2½-in. pots. If the young stock is at all taken care of another shift will be necessary by the end of March into 3-in. or 3½-in. These early propagated plants are ideal

for benching in early May, or might be shifted into 4-in. in April and benched right after Memorial Day. For those with a light, sandy soil in the field, this stock, if intended for field culture, would grow into too large specimens, but for a heavy loam hardly ever do the plants become too large for housing, no matter how early propagated.

The florist who does not set aside stock plants for propagating purposes has to depend entirely on the side shoots of the flower stems for his cuttings, and if any quantity of them is to be taken, it is well to start early in order to get them. The sooner after the New Year we get busy with rooting Carnations the easier the rooting, the better the chances for a good sized plant next July, and the more likely we are to get enough worked up. Start now, as you cut the finest long stemmed flowers of your new sorts, save the cuttings and put them into sand.

CUT-BACK PLANTS

If you are short of a certain sort, and you wish to work up a large stock from it for another season, do as the specialist does, and cut back the flowering stems and thereby encourage the plants to give you side shoots, which make the ideal cuttings. Quite a few of the Carnations grown after the middle of January, if allowed to flower, will furnish but little material in the way of cuttings. The plants send up their flowering stems, but very few side growths on them. Up to the middle of December we usually can get plenty of cuttings from the plants that were housed from the field in July and August. Don't expect too much from your stock in the way of flowers and cuttings. Of those sorts you have a large stock of, you may not have any trouble in getting all the cuttings you



Small Span-Roofed Propagating House with Cutting Benches

want, but of the newer sorts, where the stock is limited, it might pay better to sacrifice a few flowers and get the plants to furnish you the required cuttings for a large stock for next year. This you can accomplish by cutting back the flowering stems.

CUTTINGS THAT ARE ROOTED

There is only one thing to do with rooted Carnation cuttings in the sand—get them out and pot them up into clean, sweet soil, or into flats. Some growers even put the plants in benches at once and keep them there until they are planted out. Generally this will be at the end of January or early in February, and from then on until the middle of March. It is better for the young plants to get into fresh sweet soil, with but little or no manure, than into the richest kind of soil that is not sweet. Grow your small stock in a cool house, let the plants form a nice lot of healthy roots and avoid a soft growth; by so doing you lay the foundation for a healthy plant and a good constitution. The Carnation is a cold house plant, indeed almost hardy, no matter to how much heat we may see fit to expose it. If you are anxious to keep your stock healthy, do not pot up a cutting which does not look the way it should; any doubtful one will never amount to anything and it isn't worth running chances with. Make use of a nice, sunny bench for the young stock, and the best ventilated house, and if for any reason you cannot maintain a higher temperature than 45 or 46 deg. during the real cold nights, that is far better than to make it a practice to keep the stock at 53 deg.

Avoid allowing the rooted cuttings to make an inch or two of growth before they are removed from the sand.

As soon as they are rooted they should be potted up, for they have ceased to be cuttings; they are plants, and more than sand is necessary to supply the growth. There are many retail growers who feel perfectly contented as long as they know the cuttings are rooted, and they are left to remain in the sand for weeks after that, which usually means stunted plants at a standstill after being potted, or weak and full of disease. If you purchase rooted cuttings, and they are in a healthy state but only partly rooted, it is far better than spindly stock with long "whiskers," indicating they have made much of their growth in the propagating bench.

BUYING YOUNG STOCK

To those who are still short of Carnation cuttings at the third week in February or ending that month, we would suggest not to lose any time in purchasing some. Every firm making a specialty of rooted cuttings and 2½-in. stock has a good supply on hand by that date, ready for shipping, and nothing is gained by waiting longer to order them. Nicely rooted cuttings ship well almost any distance if properly packed (see illustration p. 61), and if potted will make the best of stock by the time they are to go into the field. A Carnation, like anything else, is best when allowed to come along without the least check. The plants in 2½-in. pots on February 20 and intended for outdoor culture during the Summer should have a shift into 3½-ins. This, and pinching the top out, will give the foundation for bushy plants later on. These plants, if wanted for benching right after Memorial Day (May 30), can go into a coldframe for six weeks or so previous to their being planted out. This will give the man with limited space

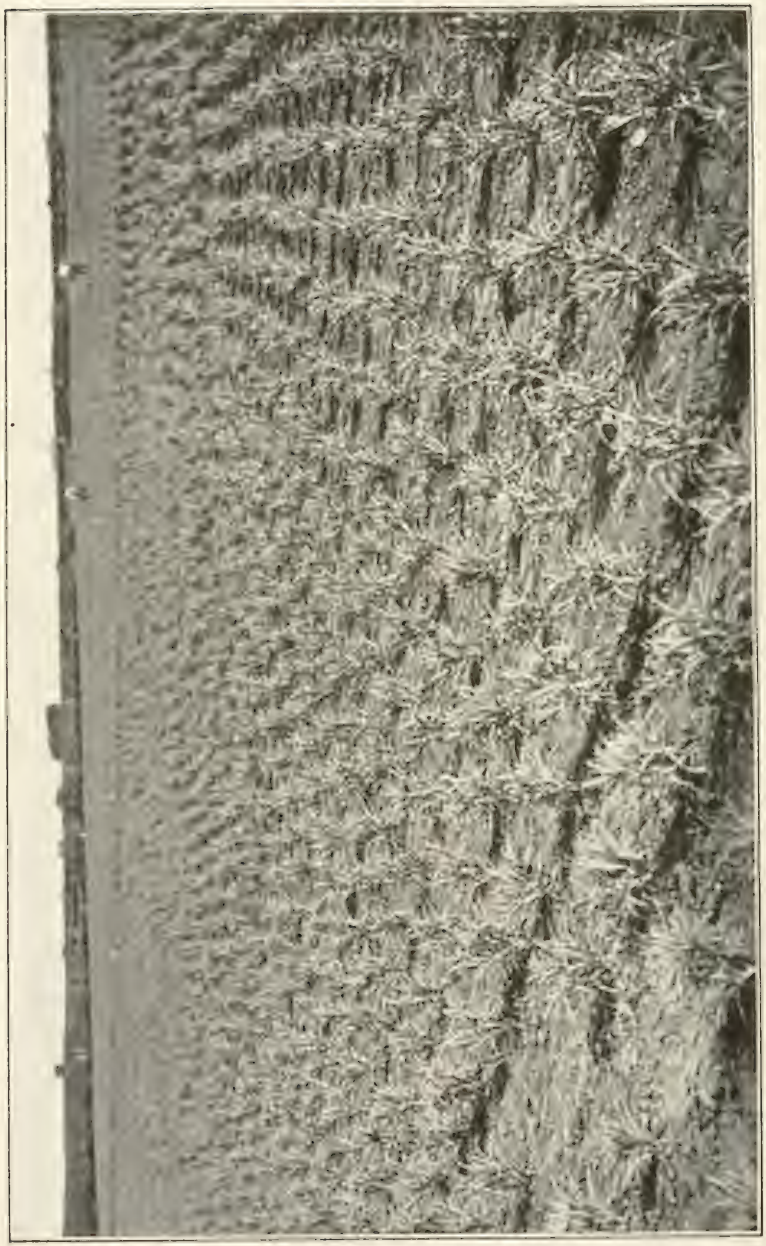
and depending on bedding stock a chance to get extra bench room.

PLANTING IN THE FIELD

In the Spring, at the approach of planting time, plow the land, giving a liberal dressing of pure ground bone, thoroughly worked in with a revolving disc harrow, after which put on the finishing touches with the leveling harrow and drag, and you are ready to plant. This occurs as soon as all danger of frost is over, which may be as early as April 10 in the latitude of Raleigh, N. C., or May 5 or 6 in the latitude of New York. Early planting is advantageous.

Two methods present themselves:

In the first case, planting in rows about 2½ ft. apart and 8 in. or 10 in. in the row; second, planting in beds of from 8 to 12 rows each, the plants being 14 in. apart each way. Both systems have their advocates. Those planting in wide rows claim a considerable saving in labor, as the cultivation is by horse or motor power. In spite of this, many prefer the bed system, first, on account of the value of the soil as prepared for planting. Soil that is properly treated is too valuable for one-half of it to be used simply for a horse to walk back and forth upon. Secondly, it may be possible to get a good supply of boys just at the right age to run the hand cultivators; thirdly, a crop of something which might be grown on the other half of the piece will doubtless more than pay for the extra labor required. About 22,000 plants to the acre is the average. In removing the plants from the flats cut them out in squares. Place the roots just deep enough to be covered nicely, only slightly deeper than they were in the flats, and press firmly; this constitutes proper planting. Deep planting is the in-



FURROW'S CARNATION FIELD AT GUTHRIE, OKLAHOMA

cubator of stem rot. The fact that the Carnation makes a great many surface roots is abundant evidence that they require a certain amount of air, and possibly light.

Pinching should be attended to regularly. Work the surface soil with the hoe to keep weeds in check and the soil aerated. Unless watering can be done thoroughly and be maintained, it should never be commenced, for when dry, the plants will draw themselves all out of shape.

FIELD STOCK AND OLD PLANTS IN JULY

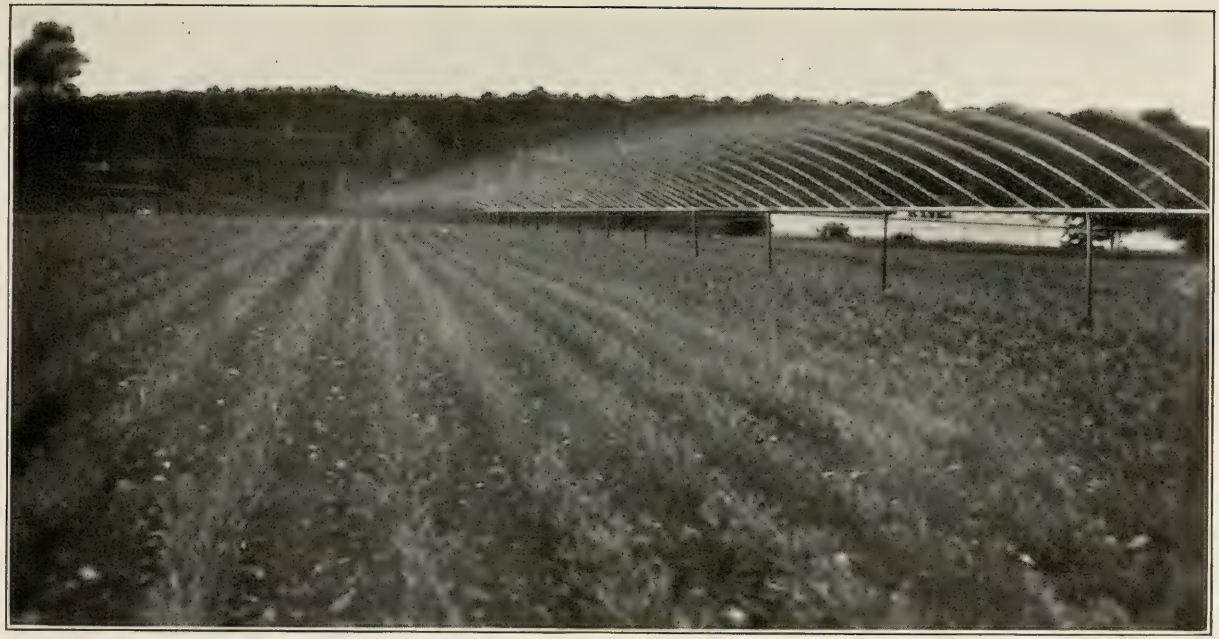
Cultivating is what the plants want in the field. A rainy season may give you the largest plants by Fall, but the ideal stock consists of medium sized ones such as have developed during a rather dry Summer, and where a high state of cultivation has been kept up while the plants were in the field. Such stock, when housed and properly attended to afterward, will make the finest of specimen plants. Avoid, if you can, a soft growth, such as you would obtain by keeping the soil around the plants soaked at all times. By so doing you are laying the foundation for stem-rot and other diseases. Don't mind because it doesn't rain for two or three weeks; run through the rows with the wheel cultivator and keep the soil stirred. By examining you will find that a few inches below the surface there is moisture, and the little roots are by this time down into it, and the more you keep a loose mulch of soil on top the cooler it will be for the roots below. You will get a short jointed stocky plant, and there is none better than such a one for housing in August. At the same time, in the very dry sections or seasons, irrigation in watering is often a necessity, else hard-stemmed plants will result, and these never grow freely.

FINISHING UP IN THE FIELD

A grower can easily tell whether the plants are going to be what he wants them to be, or whether they are going to be a failure. Plants which have for some reason or another been stunted in their growth hardly ever make up or amount to anything worth while, and we would far rather buy every bit of the stock needed to fill the benches than house a lot of doubtful plants, expecting them to make up later on. A sickly or stunted plant after being housed may come out all right in time, but what is gained by it if you have to wait months before that happens? Is it not a better way to purchase healthy plants full of life, such as will be flowering in a few weeks? There is no use planting any other, for they don't pay. While the plants are in the field, intended for housing, do not let them send up flower shoots. Keep them pinched back, and keep on cultivating and weeding. Do not work under the impression that because the plants are large enough to be called fine for benching, they do not need to be taken care of. The soil between them should be kept worked up at all times, for if you do not do that, while you may not notice any great change in the appearance of the plants, they suffer just the same; the wood becomes hard, the lower leaves turn yellow, and their growth will soon be arrested.

GETTING READY FOR HOUSING

Whether you place the plants under glass in the last two weeks of July or the early part of August does not matter nearly as much as with what little check you can do it. While there are but few plants that can stand shipping better than Carnations after being lifted from the field, the man who has the plants on his own field has the



SKINNER IRRIGATION SYSTEM IN OPERATION IN THE CARNATION FIELDS OF PETER FISHER, ELLIS, MASSACHUSETTS

The cost of installation is about $125 per acre

advantage over those who have not. A few cloudy or cool days while the plants are being transferred from the field to the bench is of great benefit and helps in getting them re-established; it beats heavy shading and keeping the stock soaked and sprayed in every way. Stock carefully packed can travel easily one thousand miles and over. As long as it is properly handled afterward, the plants will go right ahead. All this implies that one must be ready for it. The man who, about the 30th of July, looks over half rotted out benches full of old Carnation soil, and begins to think about cleaning up a bit and getting slowly ready for refilling them, and afterward looks around for stock—such a one starts out wrong. Get the benches all ready filled, and be in shape for planting when the right kind of planting weather arrives, then put on every hand and get the work done well and quickly.

LIFTING THE PLANTS

The first necessity is to have a convenient number of crates 18 in. wide and 3 ft. to 4 ft. long, prepared. Some careful cultivators exercise much care by covering the bottoms with one or two inches of wet moss to keep the roots moist until planted in. Two men with spades dig on both sides of the plants simultaneously and lift. A third shakes off the soil, inserts the roots in a bucket of water and places them in the crates with roots standing on the moss. When the plants are lifted from the crates the roots are shaken out so they will spread, and a man on either side of the bench does the planting by making a hole with the hand or trowel, spreading the roots out evenly, bringing the loose soil around the roots, shaking the plant up and down gently to distribute the soil particles

among the roots and then firmly pressing in, leaving a shallow depression around the plant to receive the first few waterings. The plants should not under any circumstances be set lower in the bench than they were in the field. This will save many a loss from stem-rot. Care should also be taken to have the smallest plants on the south side of the bench and the largest in the center or north of the center of the bench. By Winter you will be able to distinguish but little difference in the size of the plants.

THE SOIL

The matter of soil and soil supply is one of the most important. We shall therefore deal with it somewhat fully.

In speaking of ideal Carnation soil we mean the state and nature the soil should be in when the plants are benched. The best results we ever had were with soil we got out of a lot of heavy sod piled up three months before we filled the benches. This sod was taken from a pasture the last week in March, a good spade deep. It was piled up and by the end of June it was worked over with a plow and pulverizer, and later, just before it went to the benches, was worked over with spading forks and about one-sixth of well decomposed stable manure was worked into the soil. The rough pieces of sod were thrown on one pile and later made use of for covering the bottom of the benches instead of straw manure. You cannot get any better material, no matter what else you may use. Always bear in mind that Carnations lifted from the field do not want to be planted in a soil with much fertilizer nor one full of manure. The plants are not in shape to take up a lot of food; they have to get re-established first, and make new

root growth to support the top, for you have to take away a lot of roots on lifting the plants. Manure in the soil of a bench that the plants cannot make use of will sour the soil in a short time. Why, then, put in that which is not necessary? Get your plants re-established first, and then start to feed. You have all Winter to do this in, so avoid it during the hot months yet to come. The plants are better off in soil which is sweet and fibrous and contains but very little manure.

"MAKING" A SOIL

In order to get pasture sod or turf, it is frequently necessary to expend some care in developing it: in other words, we have to "make our soil." There are growers who go about this work very scientifically. The following system is a good and practical one:

The plot being selected, clear of the hedgerows, a coating of manure is put on by the manure spreader in the Fall, following a crop of Clover or Timothy. This is plowed under and the land worked once or twice. The following Spring a second dressing of manure with a sprinkling of bone is applied, and the same operation gone through as in the Fall. Then the soil is carted to the most convenient spot adjacent to the houses. Where circumstances demand or permit, the compost heap can be prepared in the same way as is usual for Roses, layer for layer of sod and manure, at the rate of approximately one load of manure to six of sod, but conditions vary even in this. Before needed, these heaps are turned over thoroughly. Thus, with the handling of the compost in the carting to the several points, it becomes thoroughly incorporated. Some establishments use pulverizers, but in many locations

this is superfluous, in others practically impossible from the presence of so many pebbles. The skillful and intelligent grower soon grasps the exigencies of his own particular conditions and governs himself accordingly, to produce results with the minimum of cost.

Where the supply of soil has been limited, the writer has noted that well pulverized manure and a sprinkling of ground bone spread over the old soil in the benches and worked in, answers passably; a layer of manure being also placed along the bottom of the benches and the old soil worked back over the manure. But these may be termed extraordinary conditions and do not call for serious attention. The old soil in most cases is taken back and spread upon the vacant lot, and the process of restoration commenced. A sowing of Rye can be planted in the early Fall. This is plowed under in the Spring and Corn planted. Corn permits of thorough cultivation to keep down weeds, which are incidental to soils from the greenhouse. After the Corn has been taken off, the land can be plowed in the Fall. In the Spring it can be worked over and seeded down with a mixture of grass seed that will promote a quick sod.

STERILIZING OLD SOIL

It has been found both economical and satisfactory to sterilize old bench soil and so make use of it a second time. We prefer, of course, entirely fresh soil, but there are times when sterilization may be tried. But even fresh soil is said to be benefited by this process—how far we are not prepared to say. For one thing, soil insects and fungus spores or mycelium are killed and other changes occur.

The term sterilization is a bad one, as a wholly sterile

soil would be worthless. What actually is done is to partially sterilize the soil by killing off some of the micro-organisms that are in it, but it has been found that certain forms of protozoa that are inimical to the nitrifying bacteria are killed off in far greater numbers than these latter, which increase again with great rapidity after the sterilizing process, and make the soil rich again quickly. There are two chief methods: (1), by the use of steam under pressure; (2) by watering the soil with the volatile liquid called formaldehyde (formalin).

The perforated pipe method of steaming consists of a system or set of perforated pipes, connected and buried in the soil of the bed, the surface then being covered with canvas or other covering and the steam passed into the system for such a period as is required to heat the soil to the necessary temperature. This temperature for best results is 180 deg. to 212 deg. Fahr., maintained for a period of an hour or more. The time required to reach this temperature will vary with the boiler area, the pressure and other steam and soil factors. The length of pipes of the system will be adapted to the beds, being one-half or one-third the total length of large beds. Generally, 1 in. pipe is used with $\frac{1}{8}$ in. holes bored in a straight line about 1 ft. apart. These pipes are buried in the beds 12 in. to 16 in. apart. The crossheads and main to boiler should be 2 in. pipe or larger.

In burying the pipes it is well to see that they lie level in the bed so that condensed steam does not accumulate at any one point; the pipes should be buried to a depth of 4 in. to 6 in., and evenly covered over with the soil. Canvas, burlap or carpet may be spread over the surface to be sterilized, thus preventing the ready escape of steam.

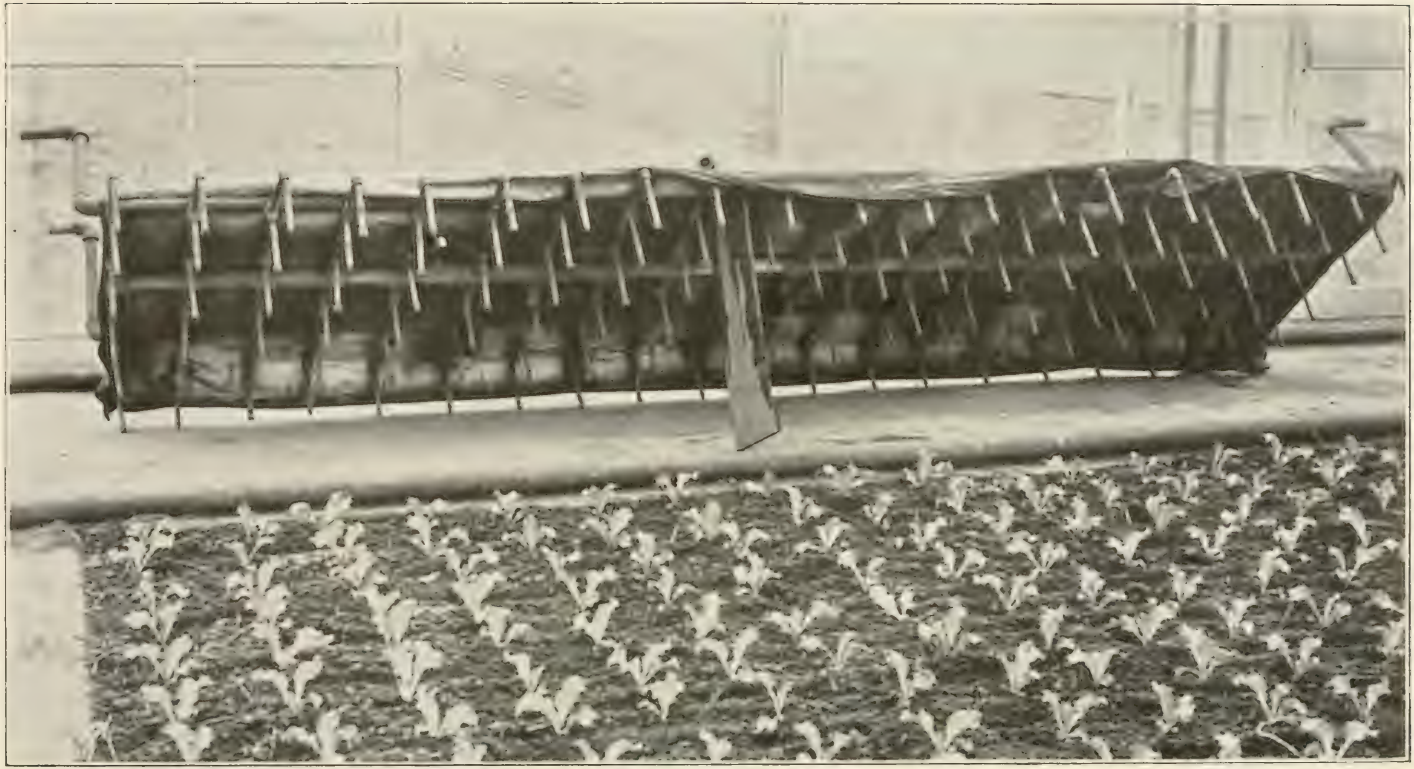
In practice it is found that to make the best use of

fuel and labor, two sets of perforated pipes are needed. Estimating 8 pipes to a bed and 30 ft. long, 240 ft. of pipe will be required for one set, and two sets with crosshead pipe will require about 500 ft. of pipe. Pipe such as required, 1½ in. in diameter, can be bought as low as 2c. per ft. from building and wrecking companies, while new 1½ in. pipe can be bought for 4c. per ft. Estimating the pipe at 3c. per ft. for 500 ft., with connections, crosshead, cost of drilling holes, and fitting, at $6, the initial cost of two perforated pipe systems will be on an average about $20 or $10 for each one.

The two sets of pipes are suggested in order to save outlay for labor and fuel. It requires time to dig up and reset a system of pipes, and this resetting of one system may be done while the process of steaming is going on in the other system; thus no labor is idle and steam will not have to be kept up unnecessarily long. In fact, the double system reduces fuel and labor by nearly one-half that required where only one system of pipes is used.

In the inverted pan method the apparatus consists of a galvanized iron pan, 6 in. deep and 6 ft. by 10 ft. in size, *which is inverted over the soil to be sterilized and the steam admitted under pressure.* The pan is supplied with steam hose connections, has sharp edges, which are forced into the soil on all sides to prevent the escape of steam, and is fitted with handles for moving it from place to place, the weight of the entire pan being not over 400 pounds.

The soil is prepared as in the first mentioned method, a few Potatoes being buried at a depth of a foot to gauge the degree of heat obtained. A soil thermometer may also be used if desired. The steam should be kept at as



Ohio Experiment Station.

INVERTED PLAN FOR STEAMING THE SOIL

high pressure as possible, 80 to 100 pounds being best, and the treatment should continue for one or two hours, depending on the pressure maintained. In experiments conducted in the Spring of 1907, one hour's steaming at 80 deg. C. under 100 lbs. pressure gave best results in killing both the fungus and the weed seeds. When one section of the bed is treated the pan is lifted and carried to an unsterilized portion and the operation repeated until the entire bed is steamed.

For the most economical use of fuel and labor in the pan method of steaming, three or possibly four pans will be necessary, according to the width of beds. Estimating the cost of the pans at $15 apiece, the first outlay will be about $50 for set of three pans and connections.

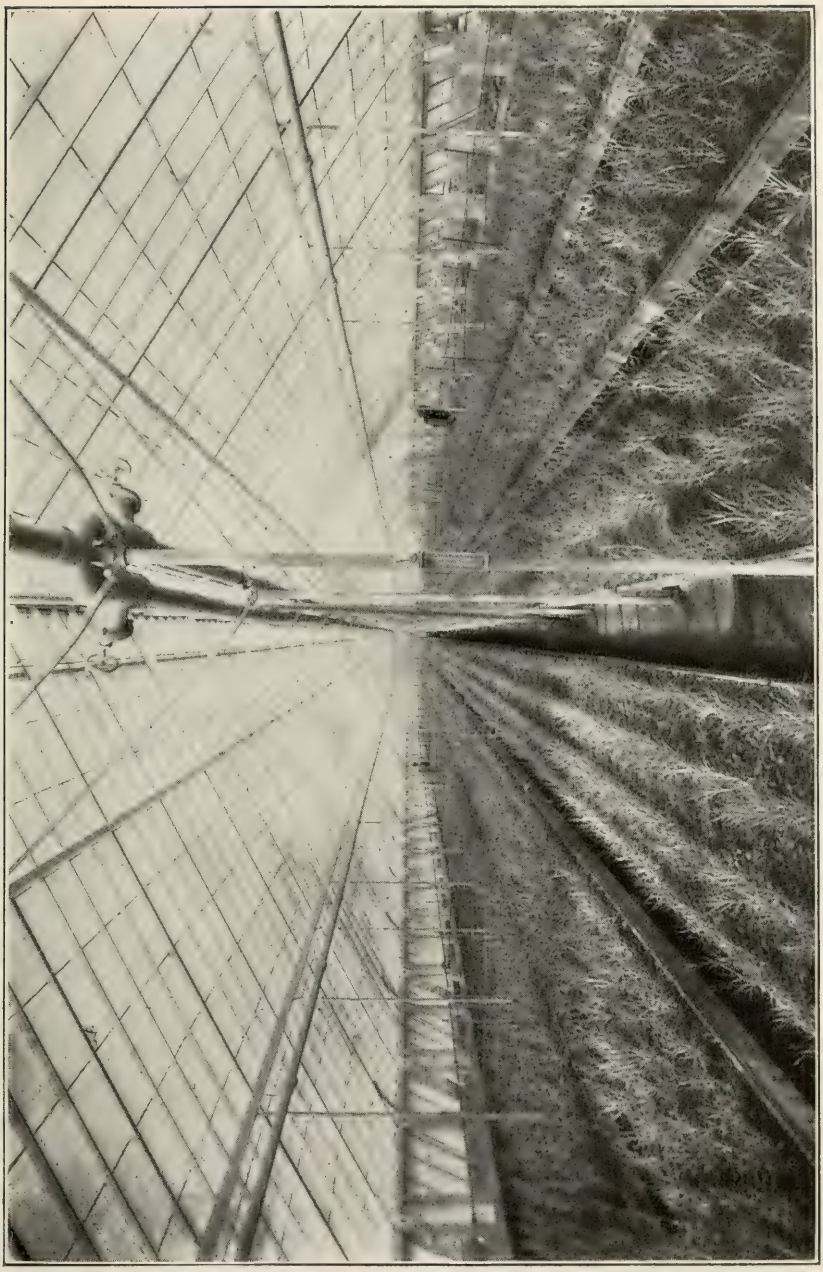
Thirdly, the drench system or watering with formaldehyde (formalin). The cost items in this case become reduced almost to that of cost of material. The best strength appears to be 3 to 3½ pints or pounds to each 50 gallons of drench, applied at the rate of ⅞ to 1 gallon per sq. ft. of surface. Estimating that formaldehyde (U. S. P. 40 per cent.) costs 80c. per gallon, and that a strength of approximately 1 to 125 (3½ pints or pounds of formaldehyde to 50 gallons of water) be used at the rate of 1 gallon of the solution to each sq. ft. of area, the material to treat one house 30 ft. x 100 ft. (3000 sq. ft.) amounts to approximately $21. The cost of treating the bench space in a house of the same size when either of the steam systems is used will be approximately $15 or $16 with the perforated pipe method, and $12 to $13 with the inverted pan method. For these figures and other facts here quoted, we are indebted to Circular 151 of the Ohio Agricultural Experiment Station, Wooster, Ohio, published in January, 1915.

FILLING THE BENCHES AND PLANTING SUGGESTIONS

To the beginner let us call attention to the drainage question; it is an important one with Carnations. You can feed poor soil after it is in the benches, but you cannot do much for soil made sour by improper drainage. Lay a good covering of straw manure all over the bottom to prevent the soil from stopping up the openings. This is important, no matter whether you make use of heavy or light soil. Five inches of good soil is enough to grow any Carnation in, but let it be sweet soil, full of fiber and life. Worn out soil, or such as has been piled up somewhere for four or five years, will not grow good Carnations, no matter how good the drainage or how much feeding you do.

PLANTING SUGGESTIONS

The shorter the time the plants are out of the soil the better, and of course it goes without saying that the roots of the lifted stock should never be exposed to sun or wind any longer than is absolutely necessary. We all know that, and yet it does some of us good to be told again. Any intelligent man can arrange to suit his own particular case about how best to mark off his benches, how to get the plants in the shortest time from the field to the house, to space the plants properly, which depends a great deal on the varieties and the size of the plants, and to water thoroughly after planting. A Carnation plant ought not to lie on its side after the first watering is done, nor should it be planted so deep that it cannot fall over; both are wrong. Shallow, loose planting retards the re-establishing of the plant, and deep planting invites stem rot; therefore right planting is of the greatest importance, and you cannot press the soil around the plants too solidly.



House, 200 ft. x 50 ft., with Benches Newly Planted

AFTER PLANTING

When housing Carnations, always remember you are disturbing a plant in full growth. You deprive it of about two-thirds, if not more, of its roots and expect it to keep on growing as if nothing had happened. In order to do this the least you can do is to provide conditions that will assist the plant as much as possible to overcome the shock and re-establish itself in the new quarters. Carnations cannot stand shade, and the only time you should subject them to it is at the period of planting and just after it, but not a minute longer than is necessary. Have the white-wash on the glass as thick as you please the first four or five days after planting, but after that take off a little each day so that at the end of the next five days it is practically all off. Spray the plants three or four times lightly each day for the first few days, and then let up a little, Get down to twice a day for several weeks, and later to once a day except on very hot days. Closed doors and ventilators produce a soft, sickly growth on Carnations, and hardy, well-pinched stock does not need to be treated so. Avoid anything that might have a tendency to weaken the stock. Keep it healthy, strong, and full of blue-green foliage. A Carnation is not a hothouse plant, and a palm house temperature or atmosphere is the opposite from what it wants.

If you want to be very good to the Carnations in their new Winter quarters you will keep on cultivating the soil between them just as faithfully as you did outdoors. If the soil is in proper condition, this work can be done better by hand than in any other way; when you use the fingers you can tell by the touch just what you are doing. Frequently when using an iron scratcher or small cultivator a partly established plant is torn loose before it is noticed, so take

care; go slow. Stir up the soil lightly all around the plants; destroy all weeds and if you possibly can afford the time clean the plants a little as you go. If the plants don't wilt any longer during the day, this is the best sign that new roots are supporting them and shade is no longer necessary. Get it off the glass, and let the full sunlight come in; open up the ventilators and the doors. Keep the stock short and bushy; you don't want them to flower at once. If the plants are in fine shape try to keep them so. Don't water because the days may be awfully hot or because you make it a rule to water every day, but water because the plants are in want of it. Go over the bench and examine it. The soil should not be allowed to dry out completely before water is applied, as this would hurt the newly planted stock just as much as to allow the roots to stand in soaking wet soil for several days. Try to keep the soil evenly moist. It is the best way for the new roots; it will encourage their growth more than anything else, and that is what you want and must have before you can expect long-stemmed flowers in September.

The Sydenham Soil Scarifier

UTILIZING SURPLUS FIELD CARNATIONS

There are several ways of getting money out of surplus field Carnations. One is to keep on pinching the smaller plants back and potting them up about the middle of September, carry them over the Winter in frames, and use them for planting out for your customers' borders. These

plants will flower all Summer long and until frost comes. Many can be disposed of by every florist who sells bedding stock, but who wants small plants rather than large ones for potting up in Fall. Another way to make surplus field stock pay is to support the plants properly, disbud them and make good use of the flowers. Your freshly benched stock will not be ready to furnish long-stemmed flowers, while good bushy plants out in the field in August ought to flower, but you should not leave them unsupported, and a little short straw or hay between the plants will help to keep them clean during rainy weather. There is still another way to dispose of your surplus. There is always someone short of what you have a surplus of. Let it be known through a neat advertisement what you have to offer, but don't make the mistake of trying to offer the plants for sale and at the same time let them flower. If you have the plants for sale keep them pinched back and keep them in the very best condition ready for benching, the way you would want to have them yourself. Stock full of buds and flowers is not fit to be planted, and it is wrong to offer them for sale.

PINCHING THE STOCK

If nothing unforeseen happens after benching, the plants should keep on doing well, and get ready to do business by September. The question about how long to keep up pinching may be of interest to many growers, for from the end of August on a great deal depends on it as to when the stock will be in bloom. But even with the most careful cultivation and following the methods we have used with success for years past, no one could set a date when to stop pinching back in order to have a crop for any

given date. Weather conditions have more to do with that than anything else. Plants at the end of August, with the majority of shoots 5 in. to 6 in. long, should be in good shape to produce flowers during the latter part of November and December. If they should set buds and start to flower on short stems it is just as well to pinch these out. A Carnation is worthless on an 8-in. or 10-in.

GANNETT'S FIELD OF CARNATIONS AT GENEVA, N. Y., IN BLOOM

stem, no matter when in bloom, and when the plants do that it is only due to insufficient roots. It shows a stunted condition of the plants, for they are not yet ready to flower. Good, long-stemmed flowers bring a fair price, even in September. Let the plants flower if they show signs of long stems. The next main crop of flowers may come along after Christmas, but what of that? If you could arrange it so that you could be sure of a Christmas crop by

timely pinching, it would be a good thing, but you cannot, and instead of keeping on pinching, stop it after August 30, and only resort to it when you notice short stems forming buds. Get rid of such and let the strength required to develop these buds into flowers, which are of but very little value to you, go toward bringing forth new shoots which will later grow into strong, heavy stems.

SUPPORTS

Supports for the plants will now also be in order. They might not need it right away, but it will not be long before they do, and it is so much easier to put up wires and twine or whatever you are in the habit of using, when you can get around the plants easily, than later on.

In our grandfathers' time all the flower buds on Carnation plants were allowed to bloom. Even long after the Carnation was grown entirely as a greenhouse plant this old custom of not pinching the buds still remained. Naturally the blooms were small and the plants short and bushy. Soon after the Carnation was brought under greenhouse cultivation, it became evident that some sort of a support would be beneficial—it would hold the plants apart from each other and thus give them more light and air. By the use of a support, a longer and straighter stem would be developed and the plants would be up out of the way so that the soil could be worked more easily.

For want of something better, the florists in some instances took twigs of trees and stuck them in the soil next to the plants. By tying the plants to these, finer results were obtained, but the growers were in search of a better method of holding up their stock. This search has been progressing ever since and one method after

another has made its appearance, been given a trial, and then been laid aside for a more improved means or method. Wood strips were tried by some, cane stakes had their time, even galvanized wire stakes such as are now much used for Roses and Chrysanthemums were resorted to, but all without entire satisfaction. Because of the many blooms on each plant the idea of tying them to a stake with string seemed unsatisfactory, and attention was turned to some sort of an arrangement to encircle the plant. Hog netting or fencing was stretched lengthwise over the bench and the plants were encouraged to grow up through the squares. Only a few gave this a trial. It proved to be a nuisance to work with, it offered serious difficulties to soil cultivation and failed to suit the growers who tried it.

FIG. 1

String and wire tying was the next to make its appearance. Wires were stretched between the plants lengthwise of the bench and strings were run crosswise of the bench between rows. This method is still in use in many ranges over the country, but it has disadvantages. With the string and wire the plants are apt to become matted and grow up into an adjoining square in place of into the square directly above. They are not held apart from each other and for this reason it is difficult to pick the blooms conveniently. This string and wire method also hinders the best and easiest cultivation of the soil, since it is very difficult to work in and around the plants. The time required to tie up Carnations by this method is very great. Many patent supports can be erected in less than one-half the time.

Some fifteen years ago, almost simultaneously, in two

Indiana towns, one-ring Carnation supports were invented such as illustrated in Fig. 1. This support was a very simple device made of one piece of wire about 4 ft. long. The ends of the wire formed the stake and were bent at right angles to the single ring. Number 11 galvanized wire was generally used for this purpose. The rings varied from 5 in. to 7 in. in diameter. These home-made supports were usually formed over inverted flower pots, although a wooden block was sometimes used. The supports of the one-ring design were made with stakes of different lengths. By way of experiment some growers combined the one-ring support and the string and wire network. The ring supports were put in place soon after the plants were brought in from the fields. The string and wire were put in place whenever the Carnations needed additional support. This was the most satisfactory way yet discovered, but it proved to be very expensive, as a great deal of time was consumed in the two operations.

Fig. 2

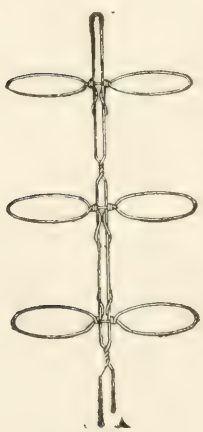


Fig. 3

The one-ring support had some merit and this fact led to the designing of a single plant support with three rings, such as illustrated in Fig. 2. This support was such a stride toward the ideal that several different companies started to manufacture them for the trade. The several makes were similar in principle, but differed slightly in construction. It was soon learned that these supports had to be fastened to something in order to insure the necessary rigidity. A running wire, stretched lengthwise

of the bench, was resorted to in most instances. The tie to this was first made by string, but later the safety lever clips were used in large numbers for this purpose. These three-ring supports for one plant each took up an enormous amount of room when packed between seasons. This was a serious objection. Many of them were damaged when not in use as they could not be packed flat. It was, therefore, no surprise that this type soon lost its popularity.

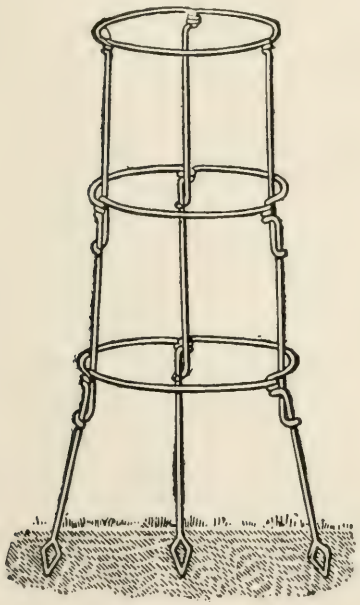
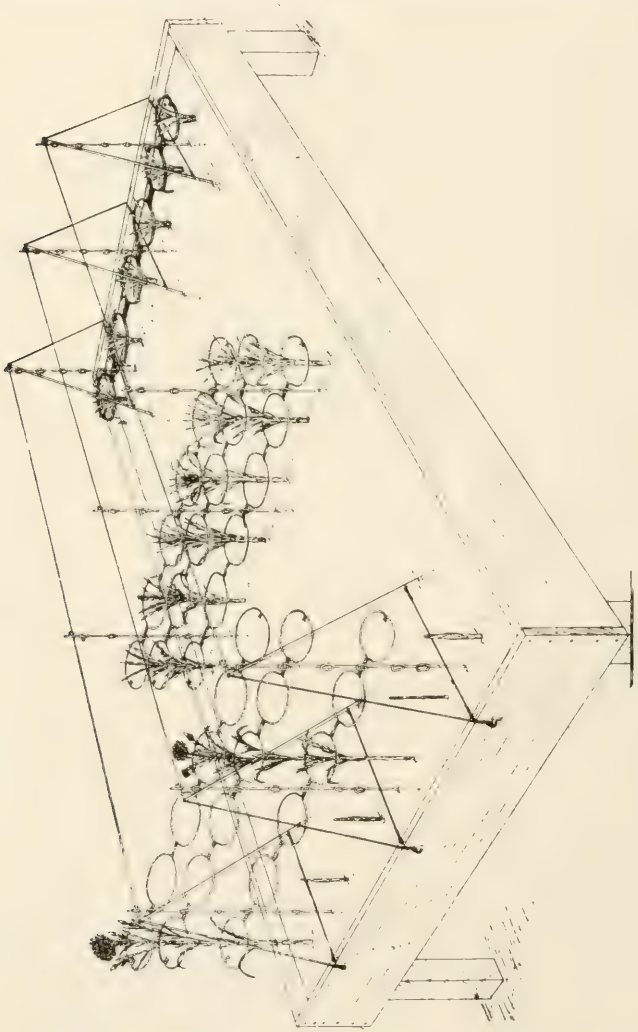


FIG. 4

The next step was the design of a three-ring support to accommodate two plants. This type is illustrated in Fig. 3. Florists everywhere welcomed this new invention and many of the better makes of this design are in use today. While they need almost as much room for storing as did the three-ring supports for one plant, still they are a decided improvement over previous designs, both in respect to rigidity and the time required to put them in place.

Fig. 4 illustrates a single plant support with two or three rings, which was designed to supply the rigidity that the supports, such as shown in Fig. 2, lacked. While this support afforded much stiffness, it put three stakes in the bench for each plant. This was objectionable in caring for the plants. From a commercial side, this was expensive to manufacture because of the excessive amount of wire. From the user's side it was expensive because of the time

it took to assemble the parts. Since the two-plant support was the most satisfactory solution to the problem yet found, an inventor, who had been connected with this

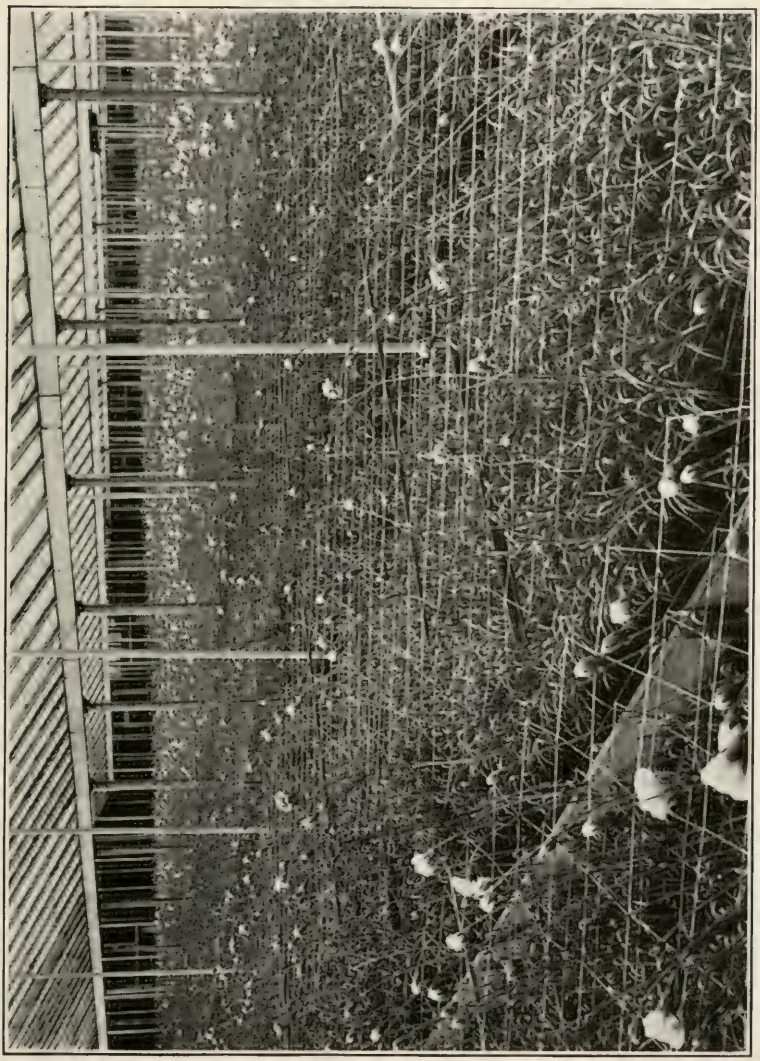


The Loop Form of Support Shown in Position

part of the business since its origin, conceived the idea of designing a three-ring support to accommodate as many plants as the grower has Carnations in each short row

crosswise of his bench. The result of his efforts is the continuous ring support.

A self-tying loop which makes the rapid tie in these



Wire Frame Method of Supporting Carnations

upports is also a feature. The supports themselves for a six-plant bench are illustrated in the diagram. These

supports have many important features which are not found in earlier makes. They are self-tying, uniformly adjustable to the growing plant in height, suit any width bench, pack flat when not in use and give ample room between the rows to work the soil. Of course, it is hardly possible that one design of a Carnation support will ever be found which will suit all growers, but it is certain that this country has already advanced farther in the development of an ideal support than have our sister countries across the water. Other forms of stakes or supports are on the market and used by growers, as the coil support and wire frames.

DISBUDDING, WATERING AND FEEDING

There are very few growers today who neglect to disbud, yet frequently, in the rush of things, we are liable to put the disbudding off too long. This should be attended to whenever the buds are large enough to get hold of, and once a week is not too often to go over a bench of thrifty plants. It pays to do it. Let the strength which is required to develop these buds go into the one you want for the flower. Keep the flower stem free of side buds or shoots. All there should be on it is the one bud at the end, which is the one to look forward to, to bring the money.

Feeding should be done regularly. The soil in the benches is full of roots, and the plants are in need of extra nourishment which has to be supplied if you need good stems and large flowers to continue. Well decomposed cow manure is always a good fertilizer. Next come bone, sheep manure and wood ashes. Avoid heavy doses; rather apply them oftener, and but little at a time.

Much care has to be exercised in the use of chemical fertilizers for Carnations, as injury may be done before the results are noticed and can be remedied. It has been shown that dried blood, which supplies nitrogen to the plant, has resulted in an increase in the number of flowers without causing deterioration in the quality. Applications of acid phosphate and sulphate of potash have not given beneficial results when applied alone.

Experiments have been carried out at the floricultural department of the University of Illinois and elsewhere, and the most important point brought out is that dried blood or sulphate of ammonia can be used with benefit on soils naturally moderately well supplied with organic matter; that no benefit has so far been found from the use of sulphate of potash on the brown silt loamy soils; that an increase in production was noted when acid phosphate was applied in addition to dried blood.

Where the soil is rich, or has been fairly well manured before planting, the old adage holds good, not to feed until the turn of the year.

These chemical fertilizers may be applied in the form of weak solutions, say half an ounce to the gallon of water, at first once in two weeks, commencing from September or October if the plants are growing vigorously, and continuing until about Christmas, then discontinuing during the dullest period until the middle of January, when the plants begin to yield their heaviest crop. The words of an eminent grower are well worth quoting: "An old soil that has been under cultivation for a long time has no vegetable fiber and is not suitable for chemical fertilizers, as you are liable to promote a sour or acid condition. . . If a man can get good cow manure and good horse manure cheaply enough, these are the proper things to use; they

require less care and less judgment." Clay's Fertilizer has proved to be one of the best artificial manures for Carnations and is much used by some Eastern growers. It is quick in its action.

In watering, it might be said that the benches require more from March 1st than in the previous two months. Do not allow them to become dust dry before water is given. This, if repeated a few times, is bound to stunt the growth. Rather manage so as to keep the soil fairly moist at all times and thereby keep the stock in the best growing condition. You know the difference, of course, between moist and soaking wet; the latter condition finishes the best of plants in a very short time.

KEEPING THE STOCK CLEAN

If cool weather prevails in the Fall, all will be well. A Carnation can stand more cold than heat, especially when planted in a few inches of soil indoors, and while the stock is getting established a house of 48 to 50 deg. at night is better than one of 55. Don't worry if the plants are slow at first in sending up flowering shoots, as long as they are full of good foliage. Give them time and do not make the mistake of applying fertilizer at once to make things go ahead. You are expecting the plants to furnish flowers all Winter, perhaps away into next May, and there is plenty of chance yet for the plants to start into flowering. A plant with eight or ten good stocky shoots, about 6 in. long, is far better than one with five shoots of which three are in flower on the first of October. Do not waste time with short shoots with buds on the end of them; remove them at once. Above all, keep the plants clean; if you do this after the benching and when the plants are settling

INTERIOR OF CARNATION HOUSE, 53½ FT. X 258 FT., OF HENRY WESTON, LONG ISLAND, SHOWING STYLE OF HOUSE, BENCHES AND METHOD OF SUPPORTING THE PLANTS

down to business in October you will have but little trouble during the Winter.

Aphis and some other pests can be held in check either by fumigating or spraying. No matter what we grow, light fumigating or spraying with weak solutions does not hurt the plants in the least, but if we wait until the aphides have got a good foothold it is quite a job to get

Contorted Leaves Caused by an Attack by Aphis

them out of their entrenchments. The good grower avoids the appearance of aphis; he fumigates or sprays regularly, say once in every seven or eight days, and whenever this is done and you start out with a clean house, nine chances out of ten it will stay clean.

What is the best preparation to use for spraying or fumigating? Make it a rule to spray once a week with a

weak dose of Aphine, and no greenfly will ever be visible on the plants. Make the solution a little weaker than mentioned on the can and apply oftener. No plant can do its best with an insect feeding on the leaves or stem, to say nothing about the unsightliness of it.

TEMPERATURES

Have a fairly moist atmosphere in the house; maintain a night temperature of about 50 deg. and make good use of the ventilators during sunny days even until toward the end of November. Keep the house cool. You may not cut quite as many flowers during the dark weeks to come, but that will all be made up later on; avoid 55 deg. at night and the dry atmosphere that usually goes with it. Keep busy cleaning and cultivating.

TREATMENT DURING DARK WEATHER

Sometimes dark weather prevails during the latter part of November and in December, probably with snow and a temperature near zero. During a clear, bright week it does not hurt nearly as much to have the temperature in the house go up to 60 or 65 deg. as to allow 55 deg. on dark, cloudy days. The few dollars one gets out of a house for flowers which have been forced out through an extra dose of steam are a small compensation for the loss of vitality in the plants. The beginner in particular should try to avoid weakening his plants by attempting to obtain an extra heavy Christmas crop with additional heat. Be careful all through December. Avoid mulching the benches that are not in need of it—rather keep the surface of the soil lightly cultivated. Let the air and a little sun get in; be careful about watering and watch the ventilators.

NIGHT TEMPERATURE RECORD

TO BE FILLED IN BY WATCHMAN

Month of NOVEMBER, 191 *House No.* _____ _____
East or West

Time	1	2	3	4	5	6	7	8	9	19	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
6 P. M.	52																														
7	52																														
8	51																														
9	51																														
10	51																														
11	50																														
12	50																														
1 A. M.	50																														
2	49																														
3	48																														
4	48																														
5	49																														
6	50																														

Carnations like fresh air and plenty of it, and the man who keeps the ventilators shut down tight in order to keep the heat in is not among the best growers. A little crack of air whenever things warm up a little means healthier stock.

If you are depending on your own Carnations for Christmas and New Year, exercise proper care in cutting the flowers; go over the plants carefully and only cut those that are nearly fully open. A careless man may cut as they come, but that is wrong; let the flowers not fully developed remain, yet not so long that they are overdeveloped and so go to sleep soon after being cut. Do your close cutting at Christmas, when you need the flowers most. At the same time an oversupply in the market then may mean weak prices, while there may be a greater call after the holidays than can be supplied. One must get to know the probable conditions as nearly as possible and act accordingly.

WORK IN LATE WINTER AND SPRING

It is really from the second week in February that many growers get the most out of the plants, and the man who considers that his work is done on the benches after this date, and does nothing beyond disbudding and cutting the flowers, makes a great mistake. He who intends throwing his plants out early in Spring in order to make room for bedding stock need not be so particular; but even with him, if he intends cutting flowers until Easter, it will pay well to spend a few hours each week on a bench and attend to the routine work, such as has to be done in order to feel that everything is in first-class shape, and those who have it that way are the ones who are making the growing of Carnations a paying proposition. Disease of any kind is liable to attack a Carnation plant, no matter how clean the

house, how well taken care of the stock may be, or in what splendid shape; yet such a plant has more resisting force, and on that account will be less affected than one that has suffered because of improper handling.

If you are obliged to grow other stock with the Carnations in the same house, and you want success with the Carnations, provide conditions and keep the house to suit them and not the other stock, and you are on the right road. Stock in a healthy growing condition is sending up 24-in. to 30-in. stems at the end of February. This means that you must support them properly and keep the bad leaves picked off.

Growing Plants Under Glass All Summer

Some growers find it more convenient to plant their young stock in the benches immediately after the flowering plants have been cleared out. In this case, the soil is renewed or sterilized and the benches made clean and the house likewise made fresh and agreeable. Others adopt a half-way system by planting the young stock outside as early in the Spring as possible, close together in the rows, say, 6 in. or 8 in. apart, just allowing enough run between to work a hand cultivator. By the first of July, if pinching has been carefully attended to, nice, bushy plants will have resulted, and may be at once housed. The greatest enemy to indoor culture is red spider. Immediately after housing, the same care as mentioned in the general article on cultivation has to be exercised.

One of the principal drawbacks to growing the plants inside, as was pointed out in a paper read before the American Carnation Society at Buffalo in 1900, by Jas. Hartshorne,

is the baking and cracking of the soil if it contains much clay, and where this happens it means a great deal more work in cultivating by hand, as against using an implement out of doors. A ridge or elevation of the soil may be left between the rows, which affords a sort of catchment for the water and prevents it running over the surface of the entire bed. The ventilators should be left open night and day until the temperature gets down to 40 degrees at night, which keeps the plants healthy, and by the second week in September blooms can be had.

Plants for Blooming More Than One Year

In the cooler sections of the country, as Maine and the Northwest, carrying the bench plants over a second year and flowering them is a well-known practice, and is successful. It is also frequently done in European establishments. The common objection is that the old plants are apt to get attacked with red spider, to get lanky, with many dead leaves, and the flowers are inferior the second year.

Some years ago a Chicago firm tried the experiment of cutting back the plants and carrying them over for the second year. The results were described by Mr. A. T. Pyfer in part, as follows:*

This is a very difficult matter to handle, *and it will not pay the ordinary small grower to sacrifice his blooms in the Spring in order to cut back the plants.* We have experimented mostly on plants we have used for cutting purposes, especially new varieties or varieties of which the cuttings have been greatly in demand, so it was not necessary for us

* Proceedings of the American Carnation Society for 1914.

to sacrifice the blooms in the Springtime in order to cut back the plants, as the cuttings were all taken off.

About the best time to cut back stock is the latter part of April, and our method is to use pruning shears and cut everything even across the bench, about six or seven inches above the soil. Disregard any nice looking shoots that might give promise of giving flowers in the Summer. White Enchantress does very well. We tried this variety by taking the plants out of the soil after cutting them back in April and replanting them in another bench. We found there was very little difference in getting them into crop and the number of blooms you would get from these plants by leaving them in the same bench, removing some of the top soil, and refilling with fresh soil and mulch. The expense of taking off the top soil and carrying in the fresh soil in boxes or pails is about as much as to empty the bench and refill it. We have been able to cut as many as twelve blooms to the plant from July 1 to Jan. 1. These were strong, healthy plants that had been used the season before for cutting purposes, therefore it was not necessary to sacrifice any blooms.

We also tried Beacon plants that were not used for cutting purposes the first year, by leaving on all the flowering shoots that would bloom by Memorial Day, and cutting everything off the plants about six inches above the soil. It is an easy matter to determine about the first part of May which buds will be in bloom for Memorial Day. You can then cut off all their shoots, leaving only the largest buds, and as the flowers develop they can be cut off even with the other shoots. In this way you will have nice, even plants, and with careful treatment they will be in good growing condition and begin to throw up a nice number of shoots by the first of July, and by the middle of

A Pot-Grown Carnation

Carnations are very seldom grown in pots in this country, but the treatment in pots is the same in all the main essentials as for stock in benches. Care should be taken to prevent the roots becoming pot bound and feeding and watering demand close attention. The illustration here given represents the one-time favorite scarlet variety, Winter Cheer.

August you will have a heavy crop of cut flowers. In this way we had some of the finest Beacon we ever grew. It requires an extra amount of fertilizer and a little more attention to run the plants over the second year, especially during the Winter months. Care must be exercised at all times to see that your stock is kept in good condition, as nothing but A1 stock should be used for this purpose.

CHAPTER VI

Sectional Cultural Treatises

SOUTHERN CALIFORNIA

The culture of Carnations for cut flowers in Southern California is an immense business, but one so unorganized and detached that it is almost impossible to give any data as to numbers grown or capital tied up in it. Of recent years it has passed very largely into the hands of Japanese growers, and while they are excellent cultivators, it is a little difficult to get any reliable information as to their business. One grower to whom the writer appealed, and who has many acres devoted to Carnations, gave it as his impression that there were 100,000 plants grown around Los Angeles. But as one firm sends out more rooted plants annually than this, the value of the information given with the insinuating smile characteristic of the "little brown man" is not very great.

There are three principal methods of growing for cut blooms. One method is to grow outdoors entirely, and there are hundreds of acres devoted this way. Another is to grow under cheap cloth or canvas houses built in the span roofed form of the ordinary commercial greenhouse. The third is strictly under glass culture, and it is this way that the "hothouse" flowers, as they are locally termed, are grown. The last named flowers are best quality and command the highest prices. Indoor culture is about the same as practised in the East and Middle West, and the

varieties grown are similar. The cuttings are inserted closely in sand, early in the new year, usually as soon as the Christmas and New Year's demand is over. The young plants are potted into 2 in., and grown on. Some growers plant them in the field for lifting later in the year, to be transferred to the benches. Others keep them in pots until the benches or solid beds are ready and then plant in the usual way. Enchantress, White Enchantress, Victory, Harlowarden, Dorothy Gordon and the newer variegated Benora, are popular kinds.

A year or two ago considerable trouble was caused to indoor growers by an insect that did great damage. It is a winged insect like a small moth, that flies by night and lays its eggs in the forming buds, causing them to wilt and die off instead of developing. One grower lost the entire cut of 25,000 plants two years ago from this pest, but has now got it well under control and loses but few. The heat by day is seldom so great in Southern California as in other parts of the country, while the nights are always cool and pleasant. For this reason the time of cutting good stock is longer and in fact may be said to cover the entire year if ordinary care is used. But as usual, when natural conditions are good, slipshod methods arise, and while there are many exceptions, it cannot be denied that the general upkeep of Carnation houses here is not so good as in less favored climates, and it is rare to find a place where everything is kept up to the highest pitch of perfection or the best results attained that could be.

The cloth houses are simply constructed affairs, with dwarf wooden walls and a framework of battens or 1 in. by 3 in. spars, and over this the cloth is nailed. Some growers omit the cloth during the growing season, covering in September or October for a Winter crop. Others keep

them under cloth continuously. The plants are grown on solid beds made wide enough to take about five rows of plants. During the propagating season in early Spring, one or more of these beds have the soil removed and replaced with sand, in which the cuttings are rooted. The most popular kinds for this style of culture are Los Angeles White, Fair Maid (pink), and Dr. Choate (red). These are also found best for outdoor planting.

Then, many growers have selections or seedlings of their own which they depend on in their separate colors but do not sell stock of them. For instance, one firm of growers in the San Gabriel Valley has a pink seedling raised some five years ago which is remarkable for its good shipping qualities. This is shipped into the desert sections of Nevada and New Mexico, Arizona and other points when many varieties fail to carry well. This firm has never sold a plant of this particular variety, preferring to keep it for its own use. Another firm raised a white form of Fair Maid which was held for quite a long time, but has now become fairly well disseminated among growers. H. W. Turner, Jr., is another good white that has been in cultivation for some years but only in 1915 was it advertised or brought to the attention of the public.

Growers of field Carnations or strictly outdoor cultivators usually purchase their young stock annually from firms who make a specialty of this class of trade, while others have propagating houses in which they raise their own plants.

Probably the finest Carnations outdoors are those that are grown near the sea, and Redondo has long been famous as a Carnation growing center. The old Redondo Carnation Gardens were for many years the rendezvous for the trade, but they have been entirely removed to make

room for modern improvements and the Carnation growers are pushed farther and farther out every year. Hundreds of thousands of flowers are sold by the growers at little improvised booths along the principal boulevards to passing autoists, while many more are shipped to Los Angeles, San Francisco, San Diego and other centers of population.

Almost all the work outside of plowing is done by hand, Japanese men, women and children working long hours planting, disbudding, cultivating and gathering the flowers. The fields look very beautiful when in bloom and the delightful fragrance is carried for miles, but it can hardly be advised as a profitable business for anyone who would have to hire all the help needed. Early and late these Japanese families work at the business, little brown, round faced youngsters, hardly higher than the Carnation plants, taking a hand in the game and coming up loaded with great bunches of flowers as large as themselves. As to the price, it is difficult to see how they make anything out of it. During times of plenty fine flowers will be offered in the streets of Los Angeles for five cents the dozen—not culls or splits, but good, well developed, well colored flowers that have been disbudded and taken care of just the same as a "hothouse" Carnation.

As hinted above, it would be a hard task to get anything like an approximate idea of the number of plants grown, for where one grower may have ten acres in Carnations, there are scores with half an acre, a city lot or two, or even a back yard behind the shack where the family resides.

IN THE NORTHWEST PACIFIC COAST

The past five years, Oregon and Washington have seen an increase of fully 50 per cent. in the output of

Carnations for the cut flower markets. This rapid increase has been owing to a wave of prosperity in this territory. The improvement in the quality of Carnations offered to the buying public also has had a tendency to stimulate the demand for this flower, and growers have enlarged their places everywhere and many new establishments have sprung up. The crop is mostly grown by larger firms who retail their own products and also purchase from smaller growers. No central market has been established so far.

Growers who dispose of their Carnations at wholesale have been receiving an average of about $2 per 100; some may average a little better, especially where quality is high. Overproduction and glutted markets have been rarely experienced, yet occasionally prices have dropped very low for a short time.

Cuttings are usually taken by the middle of October up to the middle of February, in some instances even until April. A temperature of 65 deg. is kept in the sand of the propagation bench, with 50 deg. overhead, as far as possible. After potting the cuttings into 2 in. pots, they are, after rooting through the pots, planted out into Chrysanthemum benches a distance of 5 in. apart. By pinching back once or twice, well branched plants are obtained, which are then set into their permanent benches during June. Many growers, however, set out their stock from 2 in. pots in the field during the latter half of April. Frequent cultivation and pinching back produce plants ready for benching from the middle of June to the middle of July. Early planting has always proved more satisfactory in this climate, owing partially to the extremely dry Summer weather, which favors the development of thrips and red spider in the field, where they are much

harder to control than under glass. There is also a heavy demand for early Carnations which frequently bring better prices than later ones. The average time from propagating to the beginning of cutting flowers has proved to be approximately twelve months. From the experience of many growers it has been demonstrated that Carnation varieties in general appear to deteriorate less quickly on this Coast than in other sections of the country.

Carnations are grown in all sorts of greenhouses today, but the newer ranges now being built are mostly of the Moninger and King patterns. Benches in general are 5 ft. wide. Tall and slender growing varieties are usually planted 8 in. x 10 in. apart, and heavy growers of the Enchantress type 10 in. x 12 in. The average size glass in use at the present is nearly all 16 in. x 18 in.

One of Portland's expert growers of Carnations has accurate cost and crop records based on seven years of observation. The cost of production of 7000 plants from the time of propagating until ten months' crop has been harvested, has given an average figure of 19½c. per plant, allowing, also, in the cost, for a 10 per cent. depreciation in the value of buildings. The average cut per plant proved to be 13 good salable flowers. Good croppers produced as many as 18 flowers for a cutting period of ten months.

Fuel used in the greenhouse boilers of the North Pacific States is mainly fir cordwood, for which an average price of about $4.50 per cord is being paid. Coal from local mines costs from $4.50 to $6.00 per ton, but is of a very poor grade, while good bituminous coal is selling from $8.00 to $10.00 per ton.

The leading varieties in red colors now grown are Victory and Herald, the former being closely followed by Champion. In white, White Enchantress and White

Wonder have so far proved the best producers. Matchless is being tried out successfully by several growers. Mrs. C. W. Ward is today the most popular deep pink, while Gorgeous and Rosette have proved desirable for the fancy retail trade when grown with special care. Enchantress Supreme is rapidly replacing all other light

STOPPING YOUNG PLANTS

Plant stopped once and ready for second stopping at points indicated.

Plant twice stopped and ready for third stopping

Young plant first time stopped

pinks, and for returns is considered the best variety. In striped colors, Benora is the only one to be found and is only grown to supply a slight local demand.

CARNATIONS IN THE ROCKY MOUNTAIN REGION

The notes that follow deal with a region that includes an area about as large as ninety States the size of Massachusetts. Denver, the capital of Colorado, may be taken as the center of this region, other cities being Pueblo and Colorado Springs, Colo.; Ogden and Salt Lake City in Utah; Butte, Great Falls and Helena in Montana, and Cheyenne in Wyoming.

Propagation is started early, as the young stock must have a long time in which to make plants of suitable size for the field. Owing to late frosts, planting outdoors cannot be done until about May 10; to plant earlier is to risk too much. The bright sunlight of this region causes a crisp growth in stem and foliage, and the cuttings root quickly, as they have not to struggle through weeks of cloudy weather, with snow on the roof perhaps for days at a time. They must be put promptly into the sand, else they are ruined, and once in they must be watered generally once a day and even twice.

Low houses are the most satisfactory for propagating, because artificial humidity can be created. Cloth curtains under the glass and in front of the bench help to prevent wilting. It is not believed that propagating can be successfully carried out in high, airy houses, such as one sees in the vicinity of Chicago and elsewhere.

There is a great difficulty in getting suitable soil in the States here, and as during the Winter the plants require a thorough watering at least once a week owing to the dry atmosphere, the soil is apt to get packed.

Before planting is begun the field must have a thorough soaking, either from surface ditches or with the hose, and after planting we generally water with a lawn sprinkler or by the overhead irrigation system every night while the plants are in the field. With plenty of water and a reasonably good soil, the plants make a healthy growth, though they do not attain great size. The days are hot and sunny, but if the plants are well watered they do not flag, and at night the air is cool and refreshing. It is not uncommon for the mercury to drop to 50 deg. or even to 45 deg. F. at night, following a day temperature of 90 deg. in the shade, and the Carnations seem to enjoy this. Should the plants

escape the hailstorms which sometimes nearly ruin them, they ought to be of satisfactory size by the first to the middle of August for lifting from the field and replanting in the houses.

Before beginning our planting we shade the house heavily with mud, close all ventilation and wet down the walks and under the benches. When all is ready the plants are brought from the field with all the soil that will cling to them and transferred to the bench as quickly as possible. The house is kept absolutely without ventilation for the first two or three days, and the plants are frequently syringed. The walks and the ground under the benches are kept drenched and everything possible done to prevent wilting. As soon as it seems safe, a little ventilation is given, generally starting at night, and the shade gradually removed. Within ten days the house is having full light and ventilation.

It should be noted that very few of the plants are grown *exclusively* in benches. Another important point is that manure is to be used more sparingly than in the East. The dry air and sunshine tend to ripen all growth quickly and to produce short jointed wood with shorter stems, with flowers a little under the Eastern size, but with good color and better keeping qualities than those produced with less sunshine.

It is quite the common thing to admit that a grower will be handicapped by difference in soil and climate if he moves from England to Massachusetts, or from the Atlantic to Ohio or Indiana; yet the difference in conditions between any of these points is not so great as between either of these localities and the Rocky Mountain region. Except in a few limited areas the whole of this country east of Kansas and Nebraska is less than a thousand feet above sea level,

and in the small elevated sections the difference in soil, humidity, or precipitation are not extreme; but when we come to the Rocky Mountains we find a territory over 1500 miles long from north to south, and averaging 500 miles in width, with very few points less than 4000 ft. above the sea. The air is dry, the rainfall meager, and the sunlight brilliant. In short, the whole region is arid, and ordinary farm crops cannot be produced without artificial irrigation. It is almost impossible to convey by words an adequate idea of the drying effect of the air of this region. The annual rainfall here averages about ten to twelve inches, while the rainfall in Massachusetts or in Indiana is four times that.

In regard to varieties, at one time the Lawson type seemed to be almost ideal; later on Enchantress and its sports were easily the best growers. White Enchantress is still the leading white by a large majority; Enchantress Supreme is giving an excellent account of itself, and is very satisfactory where grown. Other varieties cultivated in large quantity are Beacon, Ward and Gloriosa. Additions to this number could be made, but these are the sorts that stand out prominently.

TEXAS AND THE SOUTH

When florists of Texas and the South undertake to grow Carnations, many of them start out with a degree of doubt as to their ultimate success, and not with that optimistic buoyant feeling that they would have with other stock that they were more sure of, as being natural to Southern climates. Particularly is this true as the Gulf Coast is approached, for indeed the South cannot be reckoned with as a land of one climate or condition, and is more

diversified in this respect than one who was not well acquainted with it would believe. It is not necessarily the nearness to the tropical zone that regulates a tropical climate, for the altitude above the sea level, or other immediate local conditions, have a far reaching effect.

As far south as the city of Mexico flowers of all descriptions usually cultivated in the Northern States are to be seen and Carnations among them are grown to splendid advantage. Yet within a distance of one hundred miles, when you have come down from the plateau of the city, which is at an altitude of 7000 feet, you are at once among the Coffee plantations of the tropics. It may be well, therefore, not to consider latitude too much in regard to estimates of climate. It would be infinitely better to ask the question: "Can the Carnation be profitably grown in this or that locality?" and not, "Can it be grown for profit in the South?"

If a line were drawn longitudinally through the Southern States from Dallas, Texas, to Montgomery, Alabama, it could be said that in the territory north of this line, Carnations are being grown quite successfully by professional growers with unquestionable profit and satisfaction. But generally speaking, south of this line their success is not so well assured.

A grower of much prominence in south Texas, who had been a close observer of the Carnation and the advisability of growing it commercially, is strongly of the opinion that on the whole it is a proposition yet to be worked out here. This crop has not had a really first class test. It is clear that the specialist is, by virtue of concentration, the man who will achieve success. It is believed that with a capital of several thousand dollars an equipment may be large and thorough enough in every detail to grow Carna-

tions so to declare a dividend on the investment, even in Gulf Coast localities.

The varieties to be grown should include Pink and White Enchantress, Enchantress Supreme, and Beacon. Further trials on some of the newer kinds as they appear will become a matter of test.

The soil best adapted is well rotted turf, and rotted manure, three parts of the former to one of the latter, composted with some charcoal, and a little clay if the soil is too porous in character. Drainage is most important, and benches, with about 6 in. of soil, are advised.

One grower bases his scale of profit on the following statement: "If I cannot put in my plants early enough in this climate, so that I can commence cutting blooms in December, I would not regard the flowering period to be long enough to make it worth the while, for the usual warm weather of Spring detracts from the vitality of the plants and cuts off from a sufficiently long season at the latter stage. The fact is that with a long season, the first buds, usually with rather short stems, will bloom and after that the plant seems to rest until the next lot of stems and buds are grown out, and these are usually with the best stems and better blooms, and so on. In measuring the length of vitality to be expected, a long season of cool weather, sufficient sunshine, with proper ventilation, and absence from disease are the governing factors."

The cost of growing, with oil for fuel, would be lower in the Southern States than in States depending on coal. The matter of express carriage would be eliminated, as there would be the satisfaction of offering to the retail trade blooms that were cut the same day. For these reasons the Southern grower could command an advance in prices over the grower of the North for the same quality

of stock, and avoid the many annoyances contingent upon the business of shipping.

For the immediate present, in regard to Carnation growing in the South, a report of some encouragement may be offered in that progress is being made among about thirty or forty per cent. of Southern growers who make an attempt of some kind. At a time not too far distant, when they will have grown as old in the business of flower culture as have their Northern contemporaries, they may be expected, with that knowledge of technique and practice now common to Americans, to produce their own Carnations with as much facility as do growers of the North.

IN ALABAMA

The propagating should be well under way early in December. When the young plants are strong enough they are put out into frames, where they receive protection when that is necessary. Early grown stock of a sturdy nature can be planted in the field from 30 to 40 days earlier than would be possible in Illinois or Northern States. The planting out is done at the end of March, or at latest by the first week in April. Late planted stock never amounts to much, and even if the stand or crop looks well, the plants seem to lack vitality. Housing takes place early in July, in the usual type of greenhouse, although it is stated that good Carnations can be grown under lath houses, if promptly staked and cultivated with care, especially in the northern parts of Alabama, Georgia and on the Piedmont region.

CARNATIONS IN NORTH CAROLINA

One of the chief growers at Raleigh, in this State, begins taking cuttings early in January and continues

throughout February. The first batch when rooted is potted into 2½ in. pots, in good loamy soil. By handling in this way the firm in question does not have to shift the stock until it is ready for planting in the field. The plants, however, are fed with liquid manure six weeks after being potted, and this treatment is continued weekly until the operation of planting in the field, which takes place usually early in April.

Slat houses are not used, but ordinary greenhouses. Preparation for benching begins in July by the filling of the benches, and housing takes place usually about Aug. 1. The planting is rushed as rapidly as possible until it is completed. Very little shading is used on the glass, and these growers assert that they prefer a dry season for housing, as this causes the plants to take hold of the new soil more readily.

In regard to varieties, nothing surpasses the old Enchantress in this section, but some of the newer kinds are being tested. Northport is found to be very superior; Mrs. C. W. Ward is the standard variety of its color, while for a scarlet or red, the old Victory is still grown, together with Beacon, Commodore and Scarlet Glow. An entirely satisfactory red for here, however, has not yet been procured. These general conditions, so far as propagation, field culture and benching are concerned, hold good generally throughout this State and section.

ST. LOUIS AND MISSOURI REGION

In speaking of the Carnation industry in the locality of St. Louis, Mo., we shall endeavor, first, to take up the varieties grown for this market; second, to outline in a general way the establishments contributing

stock; and, third, the manner of culture due to local conditions.

Among the older varieties still grown quite extensively are Enchantress, White Enchantress, Beacon, Rose Pink Enchantress, White Perfection and Scarlet Glow. We

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TYPES OF BUDS AND FLOWERS

BUD AND FLOWER OF TYPICAL SINGLE, COMMERCIAL AND DOUBLE OR BULL-HEADED CARNATIONS

have among the more recent introductions, which have become quite standardized, such varieties as Pink Delight, Gloriosa, White Wonder, Benora, Rosette, Enchantress Supreme, Mrs. C. W. Ward, St. Nicholas and Herald.

We have among those of promise from the 1914 introductions—Champion, Matchless, Peerless Pink and Philadelphia. The latter is not yet proving satisfactory. In most places it will be given another trial. These varieties are not all extensively grown for this market, yet there are some of them in the different establishments hereabouts. Were we asked to name just the varieties grown generally by almost everyone, the answer would be Enchantress, White Enchantress, Beacon, White Wonder and Mrs. C. W. Ward. In the variegated, Benora, and in crimson, St. Nicholas, are most grown. The demand for either of these and also for yellow is very limited in St. Louis market, hence neither is generally grown.

Whenever those of this vicinity visit the East, they often wonder how Pink Delight took the East by storm, and considering the way it flourishes it can readily be seen why the Eastern growers take so kindly to it. Yet it is not extensively grown around St. Louis, as it is hard to do well in that region. In pink shade Enchantress still reigns. Yet Enchantress Supreme is fast finding favor. In the whites we find White Perfection has given way to White Enchantress and White Wonder. White Enchantress still holds her own as the standard white. In the rose-pink shade there is still probably more Rose-Pink Enchantress grown than any other one variety of that color. Mrs. C. W. Ward, however, is now a close competitor and bids fair to replace it soon. The local growers had great hopes for Philadelphia, but so far it has not made good, and possibly will never become generally grown, but that remains to be seen. In red, Beacon still heads the list. There are many Scarlet Glow grown, and quite a few Herald. A number of growers who have grown Champion call it the Red "White Wonder." If that proves to be the case, it

surely is the coming red. In addition to the varieties mentioned, quite a few seedlings are grown by local men who make no business of introducing them. We expect almost any day to hear of one of these worthy gentlemen making a lucky strike with a real good novelty, and then send it out to the trade, which in a large measure would stimulate others to try their hand in this excellent work.

In the immediate vicinity of St. Louis there are no very large establishments, but of small to medium size in Kirkwood and other suburbs. These range in size from 10,000 to 50,000 sq. ft., most of which has been devoted to the growing of Carnations. There are quite a number of large establishments west, as far as Kansas City and north to Chicago, also east as far as the eastern boundary of Indiana, which at times contribute a large portion of stock to this market. This, of course, takes in nearly all the large establishments of the Middle West. To try to give an estimate on the amount of plants grown from which blooms are shipped to this market would be a mere guess, and to get anything like a definite figure is next to impossible on account of the many changes from Carnations to Violets, Sweet Peas or Roses from year to year. Suffice it to say that the writer's experience goes back over twenty-five years and in all that time he has never known of a single man or firm who made any more than a decent living over and above ordinary expenses by growing Carnations exclusively for the St. Louis wholesale market. Quite a number have not even made ends meet.

We think we can say without fear of contradictory proof, that except on rare occasions within the last ten years were Carnations so scarce, unless at the Christmas holidays, that the wholesale price exceeded three cents, and many times during every season they sell as low as

$10 and even $5 per 1000. The average price received by any grower during that time seldom exceeded two cents. Of course, this is compelling many growers to take up other lines, and Roses are principally substituted. What this will do to the Rose market remains to be seen.

The style of houses is various. The construction is principally the ridge and furrow plan, in width from 15 to 40 ft., and in length not to exceed 300 ft., mostly all of wood construction. Recently a few growers have gone over to the more modern and permanent style, namely, semi-iron or steel. The largest of these is the immense range of Gullett & Sons at Lincoln, Ill. This firm has always contributed a large portion of its stock to the local market. These houses are of the Moninger all-steel type. The only house of iron construction in this vicinity is that of W. J. Pilcher, at Kirkwood, Mo., this being a Lord & Burnham house, 72 ft. x 200 ft., which at present is devoted to Roses. Carnations in this section are not deemed worthy of such fancy houses, evidently, as none has yet been erected for that purpose.

As to cultural conditions, cuttings in most of the establishments are taken from blooming plants during December, January and February. Some growers still resort to the old way of growing them in flats until planting out, but most generally they are grown in pots. We pot our early propagated stock in 2 in. pots, then later shift them into 2½ in. We think it pays us to do this, as we get much stronger plants. Field planting is generally done the latter part of April and the first part of May. Where no watering is done in the field, the dust mulch is resorted to in dry weather, with very good results. Very few Carnations are grown indoors during the Summer, in fact none in the immediate vicinity of St. Louis. This mode is

followed on a small scale north of the central part of Illinois, where also the carrying over of stock for a second year is practised, but the latter is very limited even as far north as Chicago. The lack of either of these methods of culture around St. Louis is due mainly to the extremely hot weather during the Summer months. The Summers of 1913 and 1914 were so hot and dry that culture out in the field was carried on under the most trying conditions, and plants housed during the Fall were only about half grown. This had a tendency to make Carnation growing in this section unsatisfactory.

The stock is usually planted in the houses during the month of August. The bench and solid bed culture are both employed. Bench culture predominates and probably is the most profitable. On our own place we have just resorted to solid bed culture, and we will not be in a position to say positively which is the most profitable way, bench or bed culture, until we have two seasons' records complete. One thing is certain about the Carnation in this section of the country: the average price received must increase over what it has stood at in the past few years, or some cheaper mode of culture must be found in order to make a living profit out of Carnation blooms. This is a bold statement to make, yet we have in mind a complete record from several successful firms contributing to the wholesale market for the past three years.

THE CHICAGO AND ILLINOIS REGION

To give an accurate estimate of the number of Carnation plants grown in this region is beyond the ability of the writer, but when consideration is taken of the vast territory that to a great extent depends on this section as

its supply center, some idea can be formed of the immense number of plants that is necessary to furnish flowers to supply the demand.

There is no Carnation belt here, Carnations and Roses being the staple products of the growers, and while the

Bloom of Peerless Pink, Natural Size

actual figures as to the number of plants grown may be higher for the Rose, owing to the large area of glass devoted to its culture at the very large greenhouse establishments located in this section, yet there are many of the smaller

establishments where Carnations are grown in greater quantity than Roses. The trade of the City of Chicago itself calls for a large daily supply, and in addition to this there is the heavy shipping demand which comes from all over the Central States and as far south as New Orleans, west to Denver and the Rocky Mountain regions, north to Duluth into Canada to Winnipeg and beyond.

A great deal of the product is handled on a commission basis by the wholesale florists in the city, but many of the largest growers maintain their own selling quarters. Some there are who make a specialty of growing Carnations and ship their flowers direct to the retail stores throughout this section of the country.

The flowers that are consigned to the wholesale florists to be sold on commission are mostly tied in bunches of twenty-five to facilitate handling. Those that are shipped direct to the retail stores are usually packed in a single layer in shallow wooden boxes, and a few growers take the extra care to get their flowers into the buyer's hands in the best possible condition by packing them in cardboard boxes which hold a layer of one hundred blooms.

The varieties grown comprise most of the present-day standard ones with those of the Enchantress family leading, though it is the case here as elsewhere—some grower will have great success with some certain variety and grow it more extensively than any other. White Enchantress is the leading white, and White Wonder, which is gaining more in favor each season, a close second. White Perfection seems to have been dropped entirely. It was for a long time the most popular white in this section. A few growers still grow some White Lawson on account of its good keeping and shipping qualities. Matchless is well

thought of by most of the growers and will figure largely in the plantings another season.

Dark pink or cerise has always been very popular in this part of the country. Tidal Wave, when at the height of its glory, was grown in greater numbers around Chicago than anywhere lese in the country. Cerise Queen, another old-timer, was also grown in quantity for a few years. When the variety Mrs. Thomas W. Lawson was introduced, all the other dark pinks passed away and Mrs. Lawson was the standard dark pink for a number of years and a few of them are still to be seen. Afterglow and Nelson Fisher, two others of this color, were thoroughly tried out but did not seem to gain the growers' favor and never became standard varieties here. Washington, the dark pink sport of Rose Pink Enchantress, is still grown but not in the quantity it was two or three years ago. Rosette, Peerless Pink, and Gorgeous are the leaders in this color at the present time. For flesh-pink, Enchantress and Enchantress Supreme are the varieties most generally grown. The growers of this region do not seem to be able to obtain the same success with Pink Delight as do the growers of the New England States. We are not able to get a plant large enough during our hot, dry Summer months for it to be as profitable as some of the other varieties, consequently the growers are letting it go. Daybreak, Mrs. McBurney, May Day, Mrs. Higginbotham and several others of this color that were popular in their day are now but memories.

The leading red or scarlet varieties are Beacon, The Herald, Victory, Scarlet Glow and Champion. The last was a new comer in 1914, has been well tried out, and bids fair to be the leader for a while. Nearly all of the long list of red varieties that were classed as standards in their day were prominent and grown in more or less quantity in this

region, among them being Portia, Garfield, Geo. H. Crane, The Stuart, Jubilee, Rob Craig and O. P. Bassett.

The rose-pink varieties or those of a lighter shade of pink than Mrs. T. W. Lawson, that are now the most

Gloriosa, Light Rose Pink

prominent are Mrs. C. W. Ward and Gloriosa. When we take into consideration that the variety Philadelphia was a novelty in 1914, a large number were planted, but the growers complained that it was not up to their expectations, and are growing less of it. A few Rose Pink Enchantress are still grown, but the one-time favorites of this color, namely, Wm. Scott, Argyle, Rose Queen, Mrs. Nelson, Winona, Mrs. Joost and Sangamo, have all disappeared.

Benora is the only variety grown of the variegated type, and this not extensively. The demand for variegated Carnations is very limited and of late years very few have been seen around this section. When the variety, Mrs. Geo. M. Bradt, was sent out it caught the growers' fancy so much that they stocked up with it rather heavily, consequently large numbers of all grades of quality were shipped in to the market and the buyers got tired of them, and from that time have been slow to handle variegated Carnations. Prosperity, another old-time variety with a different style of variegation, did not command the favor in this part of the country that it did in some others.

The conditions regarding the variegated varieties also apply to yellows—very few are grown, but there used to be quite a number seen here. Buttercup, Eldorado, Goldfinch, Mayor Pingree and a few others had their time.

Crimsons are grown in limited quantity, most of them being seedlings still in the hands of the raisers. The raising and disseminating of new varieties have been carried on quite extensively in this region. The Chicago Carnation Co., Joliet, Ill., during its business career was noted as a raiser of seedlings and as a disseminator of new varieties, having distributed more new Carnations than any other firm in this section. Of its own seedlings the following are the most prominent: Her Majesty, Mrs. Higginbotham,

Harlowarden, Conquest, The Herald, and Peerless Pink, together with Aviator, a red seedling which has not been sent out yet. This company was also the distributor of the varieties Fiancee and Afterglow.

Bassett & Washburn, Chicago and Hinsdale, Ill., raised and sent out the variety O. P. Bassett, which was a very prominent exhibition variety in the red class. They now have another fine red variety named Belle Washburn to be disseminated early in 1916. This firm is also noted for the high grade of Carnations it grows.

The Thompson Carnation Co., Joliet, Ill., makes a specialty of growing fancy Carnations, most of the cut being shipped direct to the retail stores. A regular list of satisfied customers year in and year out speaks well of the quality of stock grown at this establishment.

Defiance, Mrs. J. C. Vaughan, Phyllis, Lady Margaret, and Mount Greenwood, seedlings raised by W. N. Rudd at the greenhouses of the Mount Greenwood Cemetery Association, Morgan Park, Chicago, were varieties that, when in their prime, were very popular on the Chicago market. The Mount Greenwood Cemetery Association is now growing a number of seedlings which figure largely in the daily shipments to Chicago.

Poehlmann Bros. Co., Chicago and Morton Grove, Ill., has the largest area of glass devoted to Carnation growing. This company, too, is noted for the high quality of the stock it grows, and tests most of the new varieties in large quantity the year they are sent out. The rooted cutting business of this firm is also of tremendous proportions.

Wietor Bros., Chicago, are also growers of large quantities of Carnations for cut flowers, as well as doing an extensive business in rooted cuttings Peter Reinberg's

is another of the very large establishments around Chicago that grow many thousands of Carnations both for cut flowers and rooted cutting trade, while Emil Buettner, Park Ridge, Ill., has long been noted for the very high quality of the stock grown in his place.

The climatic conditions of this region vary somewhat, according to the location. Around Chicago near Lake Michigan the days and nights during the Summer are cooler than the more inland parts of the State. The rainfall during the Summer is usually ample for the plants' needs during the time they are in the field. The period from April 20 to May 15 is the time the young stock is planted out, and from this time on to the middle of June we generally have abundant rains to thoroughly establish the young plants so that they are well able to withstand the hot dry weather later on.

The question of watering the plants during the season they are in the field has long been a question in the minds of the growers. Some of the growers of this section favor watering during the hot, dry weather, while there are others with just the opposite view and resort to frequent surface cultivation to preserve the moisture at the plants' roots. We are following the latter method and have not watered the plants during the time they are in the field for many seasons. We used to think it best for the plants to keep the ground moist, and if it showed the least dryness turn on the water and then allow the plants to remain out in the field as late as the month of September so as to get as big plants as possible, but we soon found that these large plants, planted at this late date, did not have time to get enough control of the soil to produce long stemmed fancy flowers before very late in the season, the blooms of the first three months being mainly small, with short stems.

The following is a summary of the cultural methods which, according to the experience of the writer, are best suited to produce the best results in this region: Take the cuttings during the months of January and February, and as soon as they have made a nice bunch of roots pot them up into 2½-in. pots, using a live, fresh soil, inclined to a

Bloom of Princess Dagmar, Very Dark Crimson

loamy nature, and containing very little manure. The reason of this is to promote a sturdy, robust growth without any degree of softness. After potting give them a light place where they can be treated to a cool temperature with air on every favorable occasion. As the young plants grow

along, the routine work of caring for them as regards watering, temperature, and keeping the insects in check, should receive close attention at all times. Attend to the topping as quickly as the growths lengthen out to allow for it to be done properly. This part of the work is of the utmost importance because the character of the plant in the future depends largely on the care with which this work is done in the early stages of the plant's growth. Topping should always be done with the object in view of encouraging the young plant to make a sturdy, bushy growth so that when the time comes for planting out we have a plant that has already commenced to branch out and is reasonably sure of making a good plant while in the field.

The planting in the field is done the latter part of April or early in May. Directly after the planting is finished we go over the field with a hand cultivator to freshen up the surface. The growth of the plants during the first month is not very rapid owing to the cold, chilly weather we usually get, so that there is not much to do in caring for them till the weather warms, but as quickly as this happens the plants take on a very rapid growth, as do the weeds. We are not denied any of the weeds that are usually found in all parts of the country. We have our share and sometimes think a few more besides. It is a steady job keeping the land clean from the time the plants are set out until they are brought in again.

By close attention to details, the plants are large enough by the 15th of July to think about bringing them inside, and after everything about the houses has been put in readiness we make the first planting about July 20.

A good part of the soil in this region that has to be used for growing Carnations as well as every other greenhouse crop is the black loam of the prairies which, when

used alone, sours quickly, but by adding a small part of light clay soil to open it, it is improved greatly.

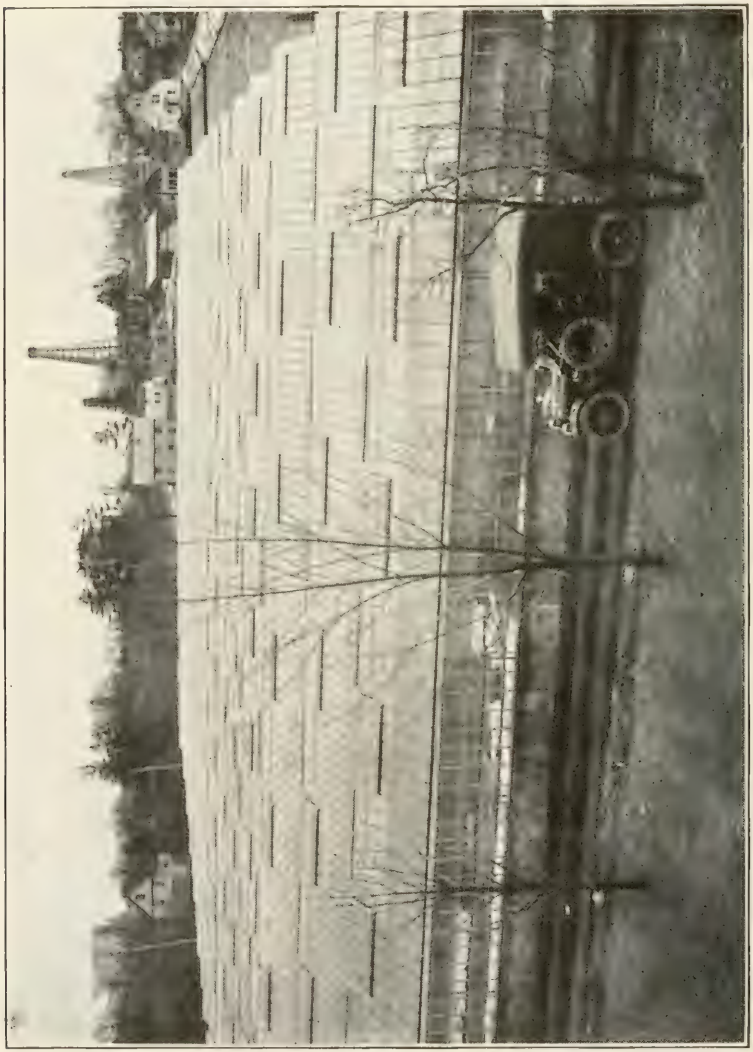
After the plants are transferred to the greenhouse and get well hold of the soil the shoots are kept topped back for another month to six weeks, according to the variety, and the time the flowers are most needed. Varieties of the same fast growth as Beacon can be topped back as late as the latter part of September and be in full crop by December 1. Then, again, varieties of slow growth similar to Rosette must not be pinched close after August, or the plants will be very late in producing their best crop of flowers.

The general routine of the work in caring for the plants after everything has been attended to in connection with the planting, stringing, wiring and starting them well on their Winter's work is the same here as in other parts of the country. We allow a night temperature of 50 to 52 deg., and on cloudy days 56 to 58 deg., and when the sun is bright enough to warm up the houses so that we can dispense with some of the steam heat we allow the temperature to run up to 65 deg. during the middle of the day, opening the ventilators according to the condition of the weather, guarding at all times against cold draughts striking the plants.

IN INDIANA AND OHIO

These States have been the particular stronghold of notable raisers of Carnations for so many years, and such large quantities of blooms are grown for market by the many growers in this area, that is has been called the "Carnation belt." The names of the Dorners, the Hills, Richard Witterstaetter, John Hartje, W. W. Coles, Fred A. Lemon, A. F. J. Baur of Baur & Steinkamp, John and Edward

Bertermann, J. M. Gasser, E. G. Gillett, and last, but not least for his influence on the spread of the love and knowledge of Carnations, L. L. Lamborn, are among those



Carnation Houses of One of the Large Firms at Cleveland, Ohio

that rise to one's mind in considering this particular rich section of the country. The earlier pages of this book dis-

cuss the work of some of these men, but it would require a volume in itself to exhaust and explain the part played by the Indiana and Ohio growers.

From Toledo and Cleveland in the north, through Akron, Youngstown, Richmond, Columbus, Cincinnati, and westward to Indianapolis, Terre Haute, etc., there is a regular chain of notable growers and of large Carnation establishments. The cultivation practices, however, are so similar to those already discussed by the writers representing Illinois and Missouri on the one hand, and Pennsylvania and New York on the other, that more is not called for in this connection.

CARNATIONS AT WASHINGTON, D. C.

In this quarter cuttings are taken in December. Propagate them in clean sand, and as soon as they are rooted pot them off into 2 in., afterward shifting them into 3 in. pots. In April, or as soon as possible thereafter, plant them out into the open field where they remain until July, when they are planted indoors and cared for under ordinary conditions. It has been found that the plan of planting them out into the field for several months is far preferable and more profitable than keeping them indoors all Summer. After a number of years of experience in growing Carnations, the writer has found, by keeping an accurate record of two houses of Carnations, each containing 9,000 plants growing side by side under the same conditions, that the following results were obtained: From plants placed out of doors and lifted in July and planted indoors, the average yield was twenty-three flowers per plant, while in the other house, planted with plants from 4 in. pots, which had not been out of doors at all, the average was fourteen flowers per plant. While the flowers

from those cared for the year round indoors seemed to be larger and stronger, the difference in price and quality is not sufficient to balance the more than one-third larger crop of those planted outdoors. From practical experience it is found that it pays, no matter how great the cost, to plant Carnations in absolutely new soil each season and not to try to plant them in the same soil one season after another. Some growers feel convinced that stem rot is largely produced by the soil being used too often for Carnations. The soil used is a sandy loam to which is added a liberal amount of cow and stable manure. The local soil is rough and difficult to handle as compared with other sections of the country. Then during the season lime is used, with bonemeal and sheep manure liberally. Carnations are grown both in solid beds and on benches in Gude's establishment, but the company is undecided as to which is more profitable, but is inclined to favor solid beds, because not only do they get as many flowers from solid beds, but the blooms also seem to be stronger and are more easily cared for in warm weather. It should be stated, however, that in speaking of solid beds, these particular Carnation houses are mostly on hillsides where one bench is above the other, thereby getting the full benefit of the sunlight, and also very good drainage, both of which are essential in Carnation growing, and the hillside solid beds have the advantage over the flat ground.

CARNATIONS IN PENNSYLVANIA

Carnations are principally grown in the eastern and western extremes, with only a nominal number grown in the center of the State. Pittsburgh, as a market and shipping center, has a number of good growers within easy

shipping distance. The largest of these is the Pittsburgh Cut Flower Co.'s place at Bakerstown, where Carnations are grown to exhibition standard and novelties are tried out here under the best growing conditions. Pittsburgh is fortunate in having a number of smaller growers who produce good stock.

In central Pennsylvania there are not many large growers, but quite a number of Carnations are grown for local trade. There is no reason why a good commission house should not locate at Harrisburg and reach a number of points that are not now properly covered. As Carnation selling points, this would open up a section for growing that is now neglected. Philadelphia is, of course, the largest and most important market for Carnations in the State, and consequently has a large number of growers producing for it, Chester and Lancaster counties both being heavy shippers to Philadelphia. The Weiss Bros. of Hatboro are the largest growers of Carnations as a specialty locally for Philadelphia. Throughout Chester and Lancaster counties a number of growers depend for their livelihood upon Carnations exclusively.

On account of the ever changing novelties introduced in the Carnation world, it is hard to name the varieties that are grown, but the man who does not specialize too strongly will have in his place Rose Pink Enchantress, White Enchantress, Enchantress proper, Enchantress Supreme and either White Wonder or White Perfection, along with Beacon and Mrs. C. W. Ward.

There is a strong tendency to specialize in one variety, and many growers are getting down to these varieties, with the possibility of growing only one. This is the part of wisdom where one special variety has demonstrated its fitness for the houses, cultural methods, and soil of the

grower, the only danger being that in the event of one of those unaccountable failures that sometimes happen, the grower would find himself without a means of income. Pennsylvania growers are fully alive to the advantages of trying out new varieties, and there is hardly a novelty that will not be found in one or other of the growers' houses.

Hybridizing has not been carried on to any great extent since the days of Chas. Starr and his associates among the Chester County growers, but there are a number of workers in a small way who grow from fifty to a hundred seedlings each season without having developed anything wonderful, or perhaps without the necessary push to get them in the market.

The type of houses for the growing of Carnations in Pennsylvania is the same as is adopted in other sections, and all over the State we find the modern house sometimes covering benches of inferior varieties, but generally showing their value in the quality of blooms produced. A few growers yet stick to the butted glass construction, but the tendency seems to be toward lapped glass bedded in putty.

The majority of the Pennsylvania growers have been using a solid bed form of culture, some with their beds directly on the natural ground on which their houses were built, others with made beds built up about 20 in. from the ground, with concrete or brick sides, about a foot of ashes or broken stone for drainage, and the soil on top of this to the depth of some 5 in. These beds give an excellent growth and much longer stemmed flowers than the ordinary bench, but are a little slower in production during the early Winter months, and on this account are in many places being discarded for benches. Both systems can be found to give money-making results, the soil and the personality of the grower both having much to do in the matter.

The New Cottage Maid, Flesh Pink a Fine, Late Spring Variety

Summer planting of the houses is practised to a very limited extent in Pennsylvania, but they are being planted earlier each season, and the average rule is to put the plants in the field between April 15 and May 1, according to location, and give them intensive field culture until the latter part of July or early August, when they are housed. The treatment in the houses is about the same as anywhere else in the United States.

For fertilizers, in preparing the soil, stable manure and sod are the chief ingredients, with bonemeal and in some localities lime, added in small quantities. After planting, sheep manure has become almost the universal fertilizer adopted, with here and there an experiment with chemical fertilizers, in some cases to the serious detriment of the crop.

To sum the whole matter up, Pennsylvania, while not surpassing the sections surrounding Chicago, New York and Boston, is nevertheless always to be taken seriously into account when Carnations are under consideration, and in the history of the Carnation is the keystone State of them all.

CARNATIONS IN NEW YORK AND NEW JERSEY

The business of Carnation growing in this quarter has assumed large proportions in late years, and constantly increasing areas of glass are devoted to this favorite flower of multitudes of people, many of the greenhouses thus utilized being of the most modern and complete construction. The enormous population of the five boroughs comprising the city of New York provides an outlet for vast quantities of flowers, and while the market is variable and gluts sometimes occur, yet the growers continue to be hopeful, and to plant Carnations in ever increasing numbers.

A large portion of the Carnation blooms coming to the New York market from day to day are grown on Long Island, various parts of that fertile section being well adapted for the growth of these plants, and containing many large establishments that have been specializing in this line for a number of years. Not a few of these establishments are located within the city limits, although the constantly increasing cost of doing business under these conditions is quite a serious matter to the growers, but it is also some advantage to be within easy driving distance of the market when there is any unusual demand for flowers. Others are within 50 to 75 miles of the metropolis, these, of course, depending on express shipments to get their product on sale. Hempstead, Baldwin, Patchogue and Blue Point are among the localities in which Carnations are grown extensively and well in the varying soils of Long Island, while over on the New Jersey side of the river there are also Carnation growers to help provide for the floral needs of New York, many of the New Jersey growers being found in the counties of Hudson, Bergen and Essex.

In these various and somewhat scattered localities there are naturally considerable variations in soil, and this fact controls, in some measure, the choice of varieties that may be grown. The Enchantress types have been much favored, the original Enchantress having been everybody's Carnation for a number of years, though now largely superseded by Enchantress Supreme. White Enchantress is also much esteemed for this market, and in the heavier soil sections it is the most satisfactory white for general purposes. In more sandy sections White Perfection and White Wonder seem to give the best results. Matchless has also made many friends among the New York growers, and will doubtless be planted in large numbers. In the

dark pink group, Mrs. C. W. Ward has occupied the most prominent place for several years past, this being a home product, so to speak, and, with Matchless, has done much to add to the prestige of the Cottage Gardens Co. of Queens.

Among the red varieties, Beacon has taken the lead for several years past, some of the Long Island growers being especially successful in its cultivation and producing enormous quantities of high-grade flowers throughout the season. Crimson Carnations are not demanded in very large quantities in New York market, and various varieties of that color are handled in moderate numbers, among them being Crimson Glow, Pocahontas and Harry Fenn. Benora is the most favored of the variegated sorts.

In regard to culture, the majority of the growers of New York and New Jersey use the field method of preparation for the young stock, planting out in the open ground during the latter part of April and the beginning of May, keeping the ground well cultivated and the plants properly cared for until the time arrives for planting in the greenhouses, the date of the latter operation ranging from the 20th of July to the 15th of August, according to the weather and the condition of the plants.

Indoor culture all Summer is favored by a few growers, and has the advantage of producing longer flower stems early in the season, while the opponents of this method claim that not only do the plants so grown produce a less number of flowers, but that the constitution of a Carnation is debilitated by continuous indoor culture. That the net results of Carnation growing for the New York market recently have not been specially encouraging to the growers, will doubtless be admitted by most of them, the wholesale prices having been far from satisfactory in most instances. Whether this has been due to an oversupply, or whether

the public is tiring of the Divine Flower, or whether the European war affected the market, are among the problems not yet fully solved.

IN NEW ENGLAND

The New England growers form not such a large, as highly influential, body. The generally cooler conditions obtaining in this section, the fertile soil in parts of it, together with the fact that herein are several millions of people and not only large industrial towns, calling for a regular supply of flowers, but many notable schools, colleges and at least two great universities, make it a growers' region.

Boston, as a shipping center, covers not only the whole of New England, but also a large part of Canada from Ottawa eastward.

The Summer climate of Maine is so agreeable and suitable that Carnations are grown continuously for cut bloom, much of which is disposed of to Summer residents. The Strout firm at Biddeford carries over its crop for two, and even three, years without apparent stress to the plants. This, however, is exceptional, as in nearly all other establishments around Boston and south thereof, the crop is raised annually in large modern structures, and while most employ the raised benches, there are exceptions, and magnificent flowers are got from at least one champion grower who employs the solid bench.

In this region too, a keen enthusiasm exists in the raising of novelties, at the head of the introducers of which, by a long way, stands Peter Fisher. Of recent years the veteran A. Roper has also exhibited some excellent varieties, while as competitors at the shows or as large growers of Carnations for cut blooms or for the sale of rooted cuttings, the names of the A. N. Pierson, Inc., F. B. Putnam, M. A.

Patten, J. A. Nelson, W. H. Elliott, A. A. Pembroke, Littlefield and Wyman, W. Nicholson, and the ex-president of the A. C. S., S. J. Goddard, stand out prominently.

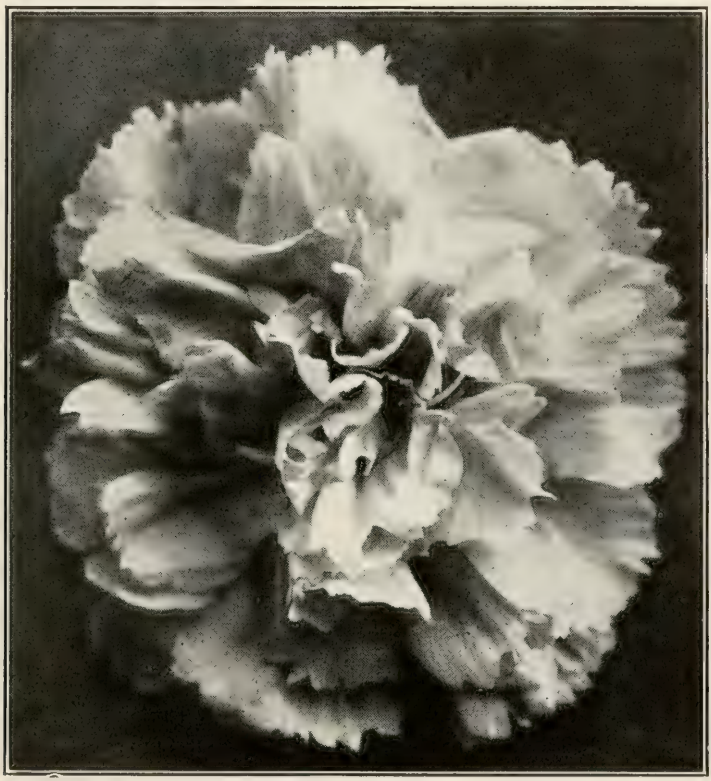
No finer flowers are produced anywhere than those of New England. The general cultural routine is almost identical to that outlined for the New York and Chicago regions. In the climate of New England, the growers have something for which they should be grateful.

CARNATIONS IN ONTARIO

It is nothing short of astonishing, the progress horticulture, and therefore flower cultivation, is making in large Canadian cities and their surroundings, and the Carnation is an almost equal first in popular favor with the Rose itself. No evidences exist of any decline, but instead, a steadily increasing output, with the greatest desire to acquire the most approved of novelties likely to win all-round popularity. Since the first flowers were produced for sale, acre upon acre of glass ranges have been erected to grow about entirely the Rose and the Carnation for the Canadian markets.

The queen city of Canada, Toronto, has in its environs three great establishments given to the growing of flowers for market: those of Mr. Dunlop, at Richmond Hill; Mr. Lawrence, in the same quiet little town, and Mr. Miller to the immediate north of the city. And no one interested in the cultivation of flowers under glass should visit Toronto without seeking out Brampton, a thriving town about twenty-five miles west, and reached by a good service of trains. Here are located the famous Dale Estate nurseries. No less than 1,250,000 square feet of glass comprise this oasis of flower culture. It was about the year 1880 that the late

Henry Dale got together a few seedlings from growers in the United States, the names of which are now unknown, and began growing the plants in pots. Five years later began the great change in methods of cultivation, which



Typical Bloom of Winsor

revolutionized the whole system practically of commercial horticulture in this country, that of transferring the Carnations from pots to beds.

It is mere repetition to enter into cultural details, so much having been said elsewhere in this book.

CHAPTER VII

American Carnations in Europe

In France, comparatively few Perpetual Flowering Carnations of the American type were grown until within a year or two ago, but the stock has been rapidly increased. The few growers who cultivate them in the north and center of France are, or were before the war, managing to get their francs at a pretty good pace, for the price realized for good quality flowers was tempting. The growers employ nearly always the bench system as adopted from England and America.

In the south of France and north Italy, the part generally known as the Riviera, probably the original home of the Carnation, quite a different system is adopted. In the low lying districts of Antibes and similar locations, the Carnations are rooted in coldframes during November to January; from there they are transplanted into other frames, and during May to June they are shifted to their permanent quarters in land that has previously been trenched to a depth of from two to four feet. The following November they are covered with greenhouses, roughly constructed out of lights. These houses are never heated, but occasionally, when the weather is very cold, they are covered with straw mats. This seems a primitive system of growing the "Divine Flower," yet it is not the most primitive by any means.

For primitiveness they certainly take the prize in the Italian Riviera. Here are millions of Carnations grown

without ever being covered by glass; even the humble straw mat is a luxury. The only covering they ever get is a little canvas, under which the cuttings are rooted during November to January. Here, no doubt, the growers have managed to get their francs, and live very easily indeed in the past, and are still doing so; but the demand for quality is increasing, and some of our friends in that part of the world will have to change their methods before many years are gone, or they will be left behind in the race.

The Carnation men in the Fatherland, as might be expected, had to test a few inventions of their own, and they tried to improve a little on the best American methods, at least as far as the building by-laws would permit them. If one wants to build a greenhouse in Germany, it is necessary to have the plans passed by a highly qualified architect, who will certainly not pass the plans until he has duly calculated that the roof of the house will stand the required pressure per square inch, that there is every protection in case of fire, and numerous other points. The result of all this is sometimes a very queer looking construction, and always a very expensively built house.

A further German specialty is the so-called "raw glass," with which quite half of the existing Carnation houses are covered. This is a thick, unpolished plate glass, as we see it frequently on roofs of railway stations and similar buildings. It is used because it saves firing during the Winter, and it saves also a lot of breakage; but how about the light during the Winter months? This, the most important point of all, has evidently been overlooked by the scientific grower; the Carnations have not overlooked it though.

Yet, in spite of it all, our German friends are doing very comfortably out of Carnation growing, and are making

their marks without much difficulty, for they are in the happy position that up to the present the demand, during the greater part of the year, is far ahead of the supply, consequently they have been enabled to form a society among themselves which fixes the prices of flowers and plants from time to time, and these prices are such that the margin of profit is a very substantial one.

THE AMERICAN CARNATION IN ENGLAND

The cultivation of the American Carnation, which is styled in England the Perpetual Flowering Carnation, has made greater strides upon the markets there than any other flower, and today holds precedence in Covent Garden Market, London. It is also interesting to note that England supplies the best Carnations sold in Paris and other Continental cities (or did until the war), while every wholesale market throughout the British Isles has its daily supply of Carnation blooms. The important part of this is that the development of the flower over there has taken place during the past ten years.

The main difference between Carnation growing in England and America is that American growers obtain approximately one-third more blooms per plant in a year. Naturally, the American can produce blooms at practically half the price that the English grower can. The average cut per plant in England is, say, twelve blooms, but many growers must content themselves with a lesser quantity. It is now becoming a common practice to run the plants on for two years, and, of course, during the second season almost double the crop is obtained, but it is questionable whether the quality of bloom is quite as good the second year. This, to some extent, depends upon the

variety, but we are inclined to think that if more care and attention were given during the Summer months, better crops would be obtained.

As every American grower will understand, there is a great deal of difference in the climates. The Briton envies the American his brighter Winter light, and the American may envy the Briton his moist Summer heat. During the Winter months it is very seldom they get, in the south of England, over 20 degrees of frost, and we doubt if it is on record when a zero temperature has occured in the county of Sussex. If the English had a colder Winter it would help them considerably, because they would use more fire heat and so dry out the houses, whereas with a warm, damp, dull atmosphere, they have no opportunity of doing this, hence the growth of the plants becomes soft, and no watering is required in Midwinter for, say, five weeks. The details of attention to the plants are practically the same as in America during the Spring, Summer and Autumn, but the Winters are entirely different.

The best modern English greenhouses are very similar to those of American growers, in fact they are imitations. Perhaps the main difference is that there is more ironwork in American houses, but then the English ones work out at a considerably cheaper figure, and the ironwork is not so necessary there, as not much snow falls neither do they get the heavy frosts. The method of heating is very similar in both countries except that it is not necessary to have the same quantity of pipes in England, and the majority are 3 in. or 4 in. pipes. Steam heating is practically unknown. Perhaps the overhead heating system is of the greatest advantage to the English grower, because in Winter it dries up the atmosphere. The old-style cast-iron saddle boiler was popular years ago, then the cast-iron

PERPETUAL-FLOWERING MALMAISON CARNATION

Some of the English raisers have been successful in introducing a race of very large flowered Carnations the result of crossing the Perpetual or American type with the Malmaison. Added to size of bloom are vigor, continuity and rich fragrance

tubular boiler, but the sectional boiler now holds sway, and they are very similar to the sectional boilers used in America, although generally not so large. Forced circulation is an innovation which many growers are experimenting with.

The system of culture most favored in England is to propagate during December, January and February, putting the cuttings into the sand in the usual way. When rooted, they are then potted into 2 in., and afterward into 3 in. or 3½ in. pots, and as a rule are planted out in the benches from this size pot in April or May, but if planted later, are generally put into a 5 in. pot in the meantime. Very few growers follow the system of planting out in the fields during the Spring, then lifting and planting in the houses in the Summer. With the uncertainty of the English climate it has not been very successful. In dull weather the plants do not establish themselves well, and produce flowers of very indifferent quality. Raised benches are adopted by the growers who have very cold, wet soil, but the majority favor solid benches. It is quite an erroneous idea that most of the English Carnations are grown in pots. This would have been true ten years ago, but it is not so today. Some of the growers favor pots, and use those of about 6 in. in diameter, and the plants are supported by a network of string and wire, the same as followed in the bench system. Many of these growers leave the plants in their pots for the second year, but after the first year the flowers are never of such good quality. Some of the smaller growers have the old-fashioned low span houses; they do not say these houses are better, but simply that the houses were there before Carnations became so popular, and it is quite surprising the good results many of them obtain, but nearly all have fitted the overhead pipes for heating.

Of course, watering is done with a hose pipe, and many feed their plants through the hose.

The marketing of the blooms is an important matter. The highest grade of stock is termed "Specials." These blooms are perfect in every detail. Two dozen blooms are packed in a long, wooden box, these are sent to the commission agent, and if the grower is known to be reliable, the boxes are not opened until the retailer has them. The next quality of blooms is termed "Firsts." Many growers bunch these in dozens and send twelve dozen in a box to the commission agent. Naturally, the "Specials" find their way to the high-class florists' shops, and the "Firsts" to second-rate shops for general floral work, and to the street hawker or peddler. In Winter, quite three parts of the stock produced in England is second quality bloom. It is only the special growers who produce the selected stock. But it pays to grow only "Specials" as far as possible. One may not get quite so many blooms per square yard of bench, but quality pays best.

One of the main reasons why the Carnation is becoming so popular in England is its great lasting qualities, and it behooves the growers to maintain or improve this quality. Many ladies remark that good blooms often last some six weeks when cut, and while the flower can maintain this reputation, it must make progress.

Competition at the exhibitions is remarkably keen. There is no detail in the floral art which is neglected. As many as 300 dozen blooms may be used, the decorative exhibit covering a space of about 225 sq. ft.

Public taste in colors is much broader than in America, and the cry in the leading markets is for a bigger assortment, yet quite half the most popular varieties are of American origin. In whites, White Wonder and White Enchantress

ONE OF THE LARGE MODERN HOUSES OF ALLWOOD BROS. IN SUSSEX, ENGLAND

are the two most commonly grown, but Wivelsfield White promises to become a serious rival, as it is more productive than either of the varieties mentioned. It has a strong strain of American blood in it. In the light pink class, Enchantress and May Day are reckoned to be the two best varieties of American origin, but Lady Northcliff and Salmon Enchantress are exceedingly popular English introductions. In dark pinks, Rose Pink Enchantress, Rosette, and Mrs. C. W. Ward are the most popular American-raised varieties, but Mary Allwood, the English variety of recent introduction, is outclassing them. As to reds, there is a great deal of controversy. Some claim that Scarlet Glow is the best variety of American origin, while the new variety Champion has a great many followers, but the growers have yet to find a variety which yields good flowers in plenty for the Christmas market, and this is what all Carnation specialists there are striving for. The prices for red flowers at Christmas are very good indeed. Of crimsons the most popular is undoubtedly the new Princess Dagmar, and this is proving a great success. It is making the English varieties Carola and Triumph strain to keep their places.

The British growers never understand why Americans do not encourage the heliotrope colored varieties. The three best of this shade are Fairmount, Mikado, and the new Bishton Wonder.

Regarding yellows and fancies, there is not much call for these, and it is doubtful whether it pays a market grower to touch them.

A new class that might be very popular in America is a cross between the American Carnation and the old Souvenir de la Malmaison, known in England as Perpetual Flowering Malmaisons. These plants produce

magnificent blooms, sometimes measuring between 6 in. and 7 in. in diameter. The leading varieties in this class are Albino, Exquisite, Lady Millar, Mrs. C. F. Raphael, Mrs. Gott and Majestic. They produce an average of nine blooms per plant in the course of a year, and in America a good salesman would have no difficulty in getting a tall price for each of the blooms. American ladies at English shows always greatly admire them and say they are confident they would sell very well in the United States.

CHAPTER VIII

The American Carnation as an Outdoor Bedding Plant

Although not very widely used as a plant for Summer bedding, the American Carnation is still a useful subject, particularly in the cooler sections of the East and Northwest. To get plants for this purpose some growers advise striking the cuttings early in January in order to get nice plants by the month of April. These are pinched once and let come right into flower. The blooms may be small, but they are very useful for decorative purposes. Whether old plants from the benches could be successfully transferred out of doors is problematical; possibly this could be done if extreme care were taken. Another method that has been employed with success is to strike the cuttings in July or August, plant them in a frame, and carry them over the Winter; remove the frame and let them bloom there the following Summer. Of course, sufficient space has to be given to the young plants to allow them full development, and feeding, mulching and watering would have to be attended to regularly.

In recent years in England the American Carnation has become a great favorite for bedding out of doors for Summer flowering. A Carnation grower in England naturally associates his plants with the land of their origin, and in Midwinter, when he scarcely catches sight of the sun for weeks together, he sighs and wishes he could turn on a few hours of that indispensable sunlight which is more abundant

in America. In Summer, however, when he reads of the frequent heat waves in the United States, he thanks his stars that he has not to contend with this extreme of climate.

When the right kind of plants have been employed, and planted at the proper season, the American Carnation has been quite satisfactory in the British Isles for Summer bedding. There it is called the Perpetual Flowering Carnation because it can be had in flower all the year round in spite of dull climate.

The best stock to employ for bedding is that which is elongating for flower about the end of April. One propagates the plants late in May, stops them twice, the second time being in September or October, and they are wintered in a cold greenhouse or frame. They winter well even in unheated frames; in fact, a plant which has been as dormant as possible throughout the Winter is preferred. Occasionally the plants are killed if left out of doors in severe Winters, even in the southern parts of Britain.

The Perpetual Flowering Carnation Society some years ago conducted trials with a view to discovering the best type of plant to use, and other facts. It is not always known to amateurs that ordinary young stock is not suitable for bedding purposes, although the comparative cheapness of the plants may tempt many people to plant them. Of course, early rooted plants stopped once may be had in flower late in Summer, but the difference between this class of stock and a bushy plant which commences to flower in May or June is very marked.

British market growers lack what American growers have—the public which pays such substantial prices for cut flowers; but, on the other hand, the British amateur is an asset in another way—he is a keen gardener. Certainly

he has his fads, but since he does not mind paying for these, the grower is the gainer. There exist in England fanciers of another kind of Carnation, a strain which has been selected not for the habit of its growth, but rather because of the form of the flower and the rounded petal—the Border Carnations. But these will probably be ousted by the American or Perpetual Carnation, because the latter produces more flowers and may be bedded out later than the so-called Border varieties and the American varieties form good material to follow early bulbs or Wallflowers. Further, the Border strain of round petaled Carnations only throws one crop of flowers a year, in July.

The cardinal points to observe in the cultivation of the American Perpetual Carnation for border work are, firstly, to secure suitable stock of the class indicated, and plant as early as possible after risk of serious frosts is passed (in England one may figure this as end of April; in Scotland in May). Thus the plants are established before Summer droughts—which sometimes come—can menace the well-being of the plants. Naturally no good cultivator would omit to dig his beds well and manure them according to needs, before planting operations commence.

"A stitch in time saves nine," so with reference to tying it is far better to have all shoots well secured to a center stake at the time of planting. A distance of a foot between the plants allows room for a small Dutch push hoe, which is employed frequently to scarify the soil. The value of this tool to induce the plants to root readily is very considerable.

Where the Border kinds are preferred, these can be utilized very profitably. Their treatment from seed or layers is discussed a few pages later, but the illustration on the next page will help to emphasize the fact that excellent

floriferous plants can readily be had from seeds. The plant here shown was raised in this way. The Marguerite and true annual kinds, like the varieties of Dianthus

BEDDING CARNATIONS RAISED FROM SEED

chinensis, are also used for beds and borders. Good selections make a fine show when effectively massed.

CHAPTER IX

The Malmaison Carnation

This beautiful flower is cultivated in most private establishments in European countries, where it is an important subject. In America, however, it is much neglected and but seldom seen. The usual time of flowering is from June to August. It is possible, however, to have it in bloom much earlier, but it is a difficult and risky practice, often resulting in the loss of many plants and weakening the constitution of the remainder. The English "Garden Manual" says that the proper and best time to propagate is in July and August, or as soon as the plants have passed out of flower. If the growths are soft, caused by shading heavily, stand the plants outside for a few days before commencing to layer. An ordinary cold-frame should be chosen for this operation, not too deep, with an ordinary soil bottom. Violet frames are very suitable for this purpose. Cover the surface with about 3 in. of finely sifted loam, leaf mold and sand, and make it moderately firm. Choose good, healthy plants, and strip them of the foliage so as to leave the intended layer about 5 in. long. Knock the plants out of their pots and plunge them in the frame; the layering process can then easily be carried out. Keep the frame closed for a few days, and shade the plants from strong sunshine. It will take about three weeks to a month to root, after which air should be freely admitted.

A few days before potting it will be found very bene-

House of Malmaison Carnations in June

ficial to sever the layers from the parent plant. A suitable compost for the first potting consists of two parts of loam, one part leaf mold and sand; 3 in. pots are generally used. Stand the newly potted plants in a coldframe, keeping the latter closed for a few days until the Malmaisons are established, then gradually admit air, finally removing the sashes in favorable weather. About the first week in October they will be ready for potting on into 6 in. pots, using a rougher compost than the one previous. We have found the following very suitable: Two parts good fibrous loam, one part leaf mold, sand and wood ashes. Pot firmly, taking great care not to bury the base of the stem. Watering will call for minute attention at this season of the year, when the plants commence to enter into the dormant state. During the Winter months they should be kept close to the glass in light, airy houses at a temperature of 50 deg. Ventilate on favorable occasions. As the Spring advances and the plants are growing freely, more water will be required; feeding can also be commenced, using soot water and liquid manure. Each plant will need to be staked and kept scrupulously clean; aphis allowed to remain for even a couple of days will do irretrievable harm. When the buds commence to burst and show color they should be shaded, otherwise many flowers will be spoiled by the sun. As the buds are opening it will be found very beneficial to syringe among the pots on warm, bright days.

Plants intended for growing on for the second year will require potting up as soon as they have passed out of flower. Stake each growth carefully so as to give the plant a neat and shapely appearance. The following are a few varieties we consider worthy of cultivation: Princess of Wales and the old Blush, two of the best and most popular; Nell

Gwynne, the only pure white; Lady Coventry, a most excellent variety, and easy to grow, nearly a coral red; Baldwin, rose pink, early flowering; Calypso, a soft flesh pink; Duchess of Westminster, salmon rose; Maggie Hodgson, a rich, deep crimson, very richly scented.

CHAPTER X

Border and Annual Carnations and Pinks

It seems strange that with so many gardeners and florists from the old countries settled among us, the Border type of Carnation as grown in Europe is not taken up here. There is much gorgeousness in the finest varieties of this type in its several sections, whether fancies, selfs, flaked or edged, as in the Picotees. The flakes are the least grown of any, even in the European countries, but the fancies when at their best have absolutely nothing to surpass them; they are large, solid, handsome and most richly colored. An exhibition of them, dressed as they are and supported with paper collars, is a sight to marvel at and never to be forgotten.

In the southern half of England, and doubtless in the greater part of France, the Border Carnation is hardy. The stock is usually propagated by layers, as shown in the accompanying diagram. These layers are taken late in July or early in August. A cut is made half way through a joint, which is kept open by being bent into the soil and pegged down. A sandy soil is used, and is rounded up firmly over the layer, which roots in a few weeks; it can then be severed from the parent stem and transplanted to frames, or be potted and kept in coldframes, covered with mats in the hardest weather in Winter. In April, or even earlier, these plants are set out. Wherever the situation is sufficiently mild, good, sturdy plants may be set out in the Autumn, and will come through any Winter where

the frost does not exceed about 25 to 28 degrees Fahr. These Border Carnations flower mainly in July and August, and require staking the same as Perpetuals. Wire coil stakes or light bamboo or similar wooden stakes are used,

From *The Garden Manual*

BORDER CARNATIONS PROPAGATED BY LAYERING

the stems being tied with raffia. A light, rich, well drained soil is the desideratum.

The plants can also be raised with great success from seeds sown out-doors in June, the young plants grown

on or potted, and planted out early the next Spring, when they will flower in Midsummer. It should be noted that the less vigorous seedlings almost invariably give the best type of double flowers and represent the choicest varieties. Very strong, broad-leaved seedlings usually yield an abundance of single flowers. In Philadelphia and southward the plants may be protected in Winter by straw. Seventy-five to eighty-five per cent. of a good strain of double Border Carnations will give true doubles from seed.

The following is a list of the best modern varieties of Border Carnations in general commerce:

Alcinous. Lemon yellow, marked purple.
Angela. Yellow, edged purple.
Benghazi. Crimson red.
Brigadier. Scarlet self.
Coronation. Apricot and madder red.
Delos. Yellow, margined red.
Diana. Pure white.
Distinction. Yellow, edged purple.
Doreen. White, marked heliotrope.
East Anglia. Buff, edged purple.
Elfrida. Terra cotta self.
Enceladus. Red, suffused crimson.
Eros. Yellow, edged and veined pink.
Fireflame. Rich crimson.
Felicity. White, striped heliotrope.
Graham-White. Yellow, edged rose.
Hampton. Fancy yellow, margined red.
Harmony. Buff, edged and suffused rose.
Helvetia. Yellow ground, mottled heliotrope.
Honora. Apple blossom self.
Isis. Bright apricot.
John Guy. Deep sulphur yellow.
Leading Lady. Yellow, marked pink.
Lord Roberts. Deep sulphur yellow.
Lord Tennyson. Yellow, edged rose.
Lavivia. Yellow, margined soft pink.
Meteor. Madder red.
Marathon. Bright madder red.
Morocco. Bright crimson.
Mrs. Lesmoir Gordon. White, feathered heliotrope.
Nora. Yellow, edged crimson.
Paderewski. Heliotrope self.
Premier. Sulphur yellow.
Queen Alexandra. Pale buff yellow.
Queen of Spain. Madder red.
Rosamond. Bright rose self.
Roy Morris. Brilliant scarlet.
Snowdon. Pure white.
Sabrina. Maize yellow.
Snow-Elf. Pure white.
Trojan. Pure white.
Violet Lloyd. White, edged rose.
Volunteer. Bright scarlet.
Yellow Hammer. Pure yellow.

The following are less expensive, but good:

Elizabeth Shiffner. Rich orange self.
Farthest North. Pure white.
Florence Holderness. Deep heliotrope shaded old rose.
Golden Rain. Yellow, edged scarlet.
Jean Douglas. Scarlet self.
King George. Crushed strawberry self.
Lady Greenall. Rosy red, shading to blush.
Langton. Yellow, margined helio.
Marjorie. Bright yellow self.
Melody. Yellow, edged rose.
Mont Blanc. Pure white.
Nene Beauty. Yellow, marked rose.
Orpheus. Soft sulphur.
Primrose Queen. Pale yellow.
Pink Pearl. Bright pink self.
Sylvanus. Terra cotta.
Scarletta. White ground, edged scarlet.
Sunlight. Yellow, edged crimson.
The Muse. White, edged pink and purple.
Venice. Reddish terra cotta.
Vedrines. Apricot and madder red.
Wanda. Crimson self.
White Lady. Pure white.

The French Grenadin can be raised from seed likewise. The flowers of this strain are double, sweet scented, and bright scarlet. There is another type, called the Early Vienna Carnation, noted for its dwarf character (12 in.), which also can be treated as a biennial; the colors are very varied. Thirdly, there are the Marguerite Carnations, interest in which began to be apparent about the year 1889 in France, and since then this remarkable strain, which can be treated perfectly as an annual, has gained great favor in England and also southern Europe. From a sowing made in gentle heat (60 deg.) in January or February, in shallow boxes, afterward being shifted into larger boxes, and finally planted out in their Summer quarters in April or May at latest, the plants will flower by August. There is no doubt about their merits; they simply smother themselves in bloom, yielding armfuls of nice, double flowers in practically all colors. These flowers are mainly fringed, though some are smooth petaled.

At least one well known seed firm, has developed an early-flowering strain of the Perpetual Carnation,

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MARGUERITE (ANNUAL) CARNATIONS. (SLIGHTLY REDUCED)

which flowers, it is said, within six months of sowing. When the plants are potted after flowering in the open ground, they bloom freely through the Winter. The annual Chinese Pink and its single and double varieties, raised from seed, are also eminently useful for bedding.

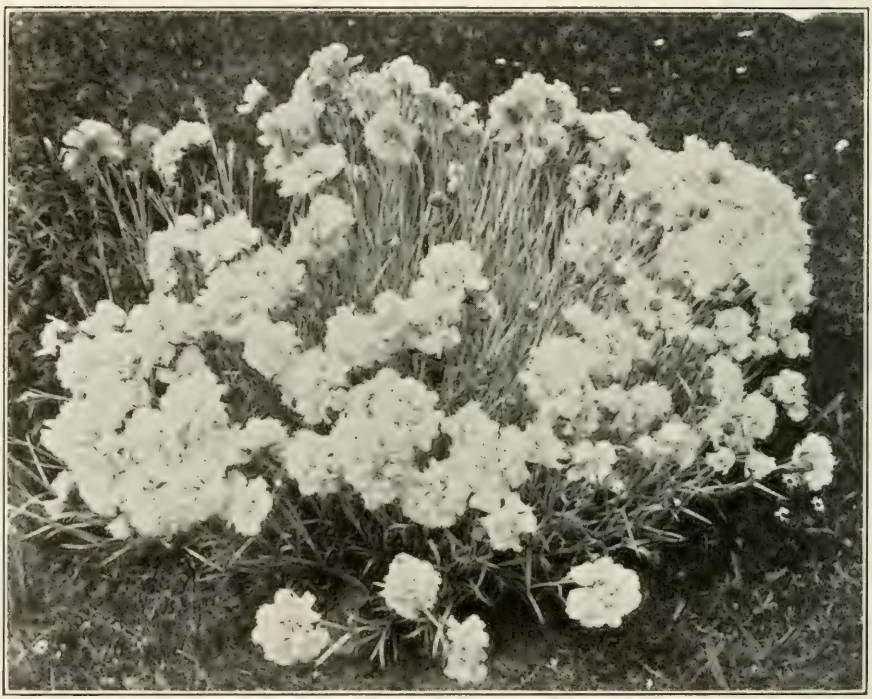
THE HARDY GARDEN PINKS

It is questionable if we make sufficient use of the hardy garden Pinks for garden decoration. The alpine species mentioned on earlier pages (14-15) are not only suitable

A Rock Garden Home for the Hardy, Dwarf Dianthuses

but necessary to the true embellishment of the rock garden, a form of gardening now becoming much more understood in the United States and frequently adopted as an outdoor feature. Particularly useful for this form of gardening is the Cheddar Pink (Dianthus cæsius), which stands our hot Summers very well, also the Maiden Pink (D. deltoides), and the Rock Pink (D. petræus). In addition there are neglectus, glacialis and alpinus.

Of the varieties of D. plumarius, the true garden Pink, the best double sorts in cultivation are Her Majesty, large flowers of purest white; Excelsior, light rosy pink; Juliette, white laced crimson; Wm. Hooper, fringed white with crimson-purple lacing; Homer, rosy red with dark center; Elsie, bright rose with maroon center; and White Reserve,



Hardy Double Border Pink, Her Majesty

free blooming white, nicely fringed. These old favorites bear Clove-scented flowers in great abundance during May and June. They are excellent as an edging to a hardy border or for use in smaller front gardens, growing usually 6 in. to 8 in. high, or say a foot when in flower. They are propagated by cuttings taken in the Fall, which

root readily in coldframes, and can be wintered therein and planted out early in the Spring before they start growth; or they can be layered like the Border Carnations. A new white of great merit is named Perpetual Reserve because of its everblooming qualities.

In England and Scotland, where these are grown to great perfection, and where fine strains have been developed, many superior varieties are listed. The following is a selection given by Dobbie & Co., Edinburgh: Albino, pure white, smooth edges, extra fine; Alice Lee, white mule, early, dwarf and free; Challenger, rose color, perfect habit, exceptionally free; Coronation, a large, semi-double flower, with claret markings; Delicata, very fine flower of rose color; Fimbriata alba plena major, a large white garden Pink; Floral Beauty, rose color, large, free and robust; John Ball, white ground with crimson markings; Mrs. Beckett Clayhills, a white Pink of exceptional merit; Paddington, pink, claret center, early and fine; Progress, large, rosy mauve flower on stiff stems, a perpetual flowering Pink; Sam Barlow, white with claret blotch, good dwarf habit; The King, large pink flower with crimson markings, a perpetual flowering variety.

The ordinary single forms of common Pink or Pheasant's Eye are also most adaptable and useful edging and rockery plants, being perfectly hardy. So is the Sweet William, which may be had in many fine colors, as salmon pink, white, scarlet, etc. They are raised like the Marguerite Carnations or can be purchased as plants. The so-called Everblooming Hybrid Sweet William, which is a form of China Pink, but is perennial and hardy, is named latifolius atrococcineus, with brilliant scarlet, double flowers.

CHAPTER XI

Varieties of The American Carnation

In a description of varieties it is useful only to include those that are mostly grown at the present time. The introductions of recent years are far in advance of the older sorts, just as those mentioned in this chapter are likely to be outshone by newer and better ones in a short time.

The Carnation of the present is a vastly superior flower to the Carnation of fifteen or twenty years ago. Size, stem, color and producing qualities have all been greatly improved since that time, and our beautiful flower is more popular and is used in a greater number of ways than ever before.

The result of a vote cast by fifteen of the best known commercial American growers in March, 1915, showed the following results:

	Votes
White Enchantress	12
White Wonder	12
Beacon	11
Enchantress Supreme	10
Mrs. C. W. Ward	10
Matchless	7
Enchantress	7
Pink Delight	6
Benora	6
White Perfection	5
Champion	4
Rosette	4
Philadelphia	4
Gloriosa	3
Rose Pink Enchantress	3

An election of varieties was taken by an English horticultural journal early in 1915, which resulted in showing which were the favorites in that country:

	Votes		Votes
*May Day	30	*Champion	13
*White Wonder	28	Mary Allwood	12
Triumph (British)	28	*Rose Pink Enchantress	11
*White Enchantress	23	*Philadelphia	9
*Mrs. C. W. Ward	22	*Pink Delight	8
*Enchantress Supreme	21	Carola	8
*Scarlet Glow	19	*White Perfection	7
Lady Northcliffe	18	Lady Meyer	7
*Enchantress	17	Salmon Enchantress	6
*Winsor	17	*Rosette	6
*Beacon	16	Empire Day	5
Mikado	14	Queen Alexandra	5

Those marked with an asterisk (*) are American raised varieties.

Of the varieties introduced since January, 1913, these were voted on as follows:

	Votes		Votes
Champion	28	Mary Allwood	11
Gorgeous	23	Matchless	8
Scarlet Carola	14	Lady Fuller	7
Pink Sensation	13	Queen Alexandra	7
Princess Dagmar	13	Circe	7
Philadelphia	12	Enchantress Supreme	6

The best for outdoor culture, according to the election, were:

	Votes		Votes
May Day	30	White Perfection	14
Britannia	28	Beacon	13
Enchantress	23	White Enchantress	12
Triumph (British)	21	Rose Pink Enchantress	11
Mikado	17	Mrs. Burnett	10
Winsor	17	White Wonder	10

In selecting what varieties he should have, the grower ought to choose the best keepers, as they are the only ones worth growing commercially.

Beacon.—A good scarlet, very free, giving a continuous crop of flowers from early Fall until Spring. It is of vigorous growth and good habit, and is a great favorite for Christmas. It is without doubt more grown than any other red, and with some growers seems to improve with age. In

some places it splits badly in Midwinter, but its freedom of flower somewhat compensates for that.

Benora.—The best variegated ever disseminated. It does not make a very large plant in the field, but when planted in the house it flowers early and continues to improve right through the Winter and Spring, giving remarkable flowers even in June when most all the others have deteriorated in size and in color. Benora is a fine white, striped with bright red, the stripe being narrow and evenly marked, giving it a pleasing appearance. It has fine form and substance and is one of the very best keepers. It makes no surplus grass and throws fine flowers on a long, strong stem. Benora is free and healthy, and undoubtedly by its many fine points has made the variegated Carnation more popular with the flower buying people.

Champion.—This is a bright scarlet. It makes a rapid growth, comes in early, and does not let up through the whole season. Very fine until January, after which it goes somewhat off color and splits a little, coming back in fine form in March until June.

Gloriosa.—A beautiful soft shade of pink of good size. In Midwinter, Gloriosa is at its best, and at that time is one of the very best Carnations ever raised. It is a poor grower in the field, making a small plant. It is also apt to come light on the edges in early Fall and late Spring. It also goes very much off crop for a while after March first.

Gorgeous.—One of the novelties of 1914. It is a dark pink of an unusual shade. It is a very vigorous grower and the flowers are produced on enormous stems of 4 ft. or more. Its form is not of the best and it comes an off color through the Winter. It is an exceptionally fine keeper and produces lots of flowers in the Spring.

Enchantress.—An old favorite which is still largely

EXHIBITION VASE OF THE HANDSOME ENCHANTRESS SUPREME

grown. Flesh pink in color and of large size, it has held its own for a good number of years. It is of good habit, grows free and strong, and flowers well both early and late. It has rather too many petals and splits its calyx somewhat, but altogether is a good Carnation.

Enchantress (Rose Pink).—Identical with Enchantress except in its color. This variety was grown quite extensively for a few years, but is not often seen now.

Enchantress (White). This is another sport of Enchantress, a pure white which has been deservedly popular, as it has all the good qualities of its parent, added to which is an even more robust constitution.

Enchantress Supreme.—A later sport of Enchantress, of great merit. A shade of salmon pink, a trifle larger than the old variety. Very healthy and free of growth and does not split badly.

Harry Fenn.—Today the best crimson, as it has been for a number of years. Rather small in size but of fine color and a good keeper, with a freedom and growth of flower ahead of anything else in its color.

Matchless.—A wonderful white Carnation, so voted by almost everyone who grows it. Very healthy grower, with fairly heavy foliage of a dark green color. This variety will give as many flowers as, or more than, any other Carnation. The flower has good size and form, with nicely serrated petals. It is very fragrant, an excellent keeper, and the blooms can be left on the plant longer than those of any other variety. This Carnation gives promise of taking the place of all the older whites. Its only faults appear to be a little shortness of stem in the early Fall, and the fact that it has some pink in the flower in the middle of Winter.

Mrs. C. W. Ward.—A dark shade of pink which is well liked in most localities. It is of strong habit and of large

size. It has also good keeping qualities and is fairly free flowering. It seems to do especially well around New York and Philadelphia. Farther north it is apt to be streaky in Winter and splits somewhat in the dark days. Grown at its best, it is particularly fine.

PHILADELPHIA.—The color is a fine shade of light pink, between Gloriosa and Mrs. Ward. Philadelphia makes a large plant and produces lots of flowers, but its keeping qualities are not of the best.

PRINCESS DAGMAR.—A very dark crimson of great size, but too dark. It seems to be well in favor with the English growers.

POCAHONTAS.—A fine crimson and a good keeper, but a little too dark.

PINK DELIGHT.—A fine commercial Carnation, grown very successfully in some localities and declared to be one of the very best varieties ever disseminated. The color is flesh pink. A very "hard" flower, which will keep and ship as well as, or better than, any other Carnation. It is rather difficult to propagate, but when rooted grows rapidly. It will flower early and keep going right through the entire season, making no surplus grass. Gives very few poor flowers and scarcely splits at all.

PEERLESS PINK.—Dark pink in color. A nice growing plant, starting to flower early and giving fairly good satisfaction at all times.

ROSETTE.—A cerise pink of healthy, clean growth. Rosette is a little slow in starting in the Fall, but after it commences to flower will keep at it steadily. In Midwinter it is nearly perfection, the color being even and beautifully bright. In the sunny days of Spring it will be inclined to get light on the edge and will need shading early. At its best it is remarkable for its wonderful color and its keeping.

YELLOW PRINCE AS EXHIBITED AT THE AMERICAN CARNATION SOCIETY'S SHOW, 1914

White Perfection.—A fine Carnation of purest white, excellent form and of nice habit, good growth and fairly free flowering. A great favorite a few years ago.

White Wonder.—In many respects like White Perfection, but making a larger plant and producing more flowers, though not so good in form.

Winsor.—A great favorite for several years. A light pink of vigor, and a producer of note, especially in the Spring months. Stands the warm sunny weather better than most varieties.

Yellow Prince.—The yellow Carnations have not attained the size and form of many of the other colors, but there is an improvement in each new one that appears. Yellow Prince is a bright yellow, medium in size, and free in flowering. It keeps well but splits rather badly. A real good yellow Carnation has yet to make its appearance.

There are some very promising new varieties that have been on exhibition at various shows. Among them are:

Alice.—A nice soft shade of pink between Pink Delight and Gloriosa, medium in size and has the reputation of being very free.

Alice Coombs.—A fine pink, of Gloriosa shade, with a wonderful stem and calyx.

Cottage Maid.—A light pink sport of Mrs. C. W. Ward.

Crystal White.—A magnificent white, of nice form and very fragrant.

Good Cheer.—A dark pink that has the appearance of making a good commercial variety.

Pink Sensation.—A light pink of great size, which should be an acquisition as a fancy flower.

There are several more apparently of merit, but it is not safe to predict the future of any new variety.

CHAPTER XII

Hybridizing and Crossbreeding

There is perhaps no flower that has been so completely transformed by cultivation as the Carnation. As we have it growing today, it bears but slight resemblance to the small, five-petaled flower of two thousand years ago. Not only has the bloom been improved by the addition of petals, but from a Summer-flowering plant its blooming period has been extended to cover the entire year. From the small-flowered wilding, cultivated by the Greeks, there has been evolved, by careful attention and breeding, the modern 4 in. flower carried on a 3 ft. stem.

While a considerable portion of this improvement, especially of that achieved during the past quarter of a century, may be attributed to improved cultural methods, particularly as regards the size of the flower, to the hybridizer belongs the credit for changing its habit of blooming from the periodic to the perpetual, and for the wide range of colors seen in the numerous varieties.

The breeding of Carnations is productive of both pleasure and profit, for there is no more fascinating work than the breeding of plants, with its expectations, surprises and disappointments. Many growers indulge in this work in a limited way for diversion, taking keen delight in the variations that can be seen in a batch of seedlings. Occasionally a valuable variety is produced, but most of the real acquisitions have been produced by the few who

have studied the problem carefully and followed it up systematically over a long period.

It has been a source of comment that while the breeding of Carnations has been carried on for many years, there has not as yet appeared a true bred Carnation, one that will reproduce itself from seed. This can perhaps be accounted for in two ways. In the first place, the perpetual flowering Carnation of today is so different from the original from which it sprang, and the change has been so gradual, there remains a strong tendency to revert. Then, too, the breeders have not concentrated their efforts on the production of a true bred strain. The custom has been to infuse the blood of any variety possessing certain qualities in which the strain may have been deficient, consequently the ancestry of most varieties is so complex that no definite results could be relied upon when a cross was made.

Unexpected colors and other characteristics crop out after several generations, and it is only by close breeding over a long period of years that such variations can be eliminated, as we have demonstrated in our own work. For years we have confined the bulk of our crossing to certain colors, separating the colors into five classes, namely white, flesh pink, deep pink, red (including crimson), and yellow. We cross a white variety with another white, a red with another red, and so on. As a result, we get each year a larger per cent. of true colored seedlings. But as stated above, there will occasionally crop out a color that has not appeared in the pedigree for several years. For instance, we have two seedling varieties which are identical (deep flesh pink) in color. One came from two intense scarlets, the other from two pink varieties. The influence of the parents can be seen, however, in that

the color of the first named holds exactly until the bloom goes to sleep, not even bleaching in the strong sun, while the other bleaches badly. Out of the same red × red pod, came also a pure white variety.

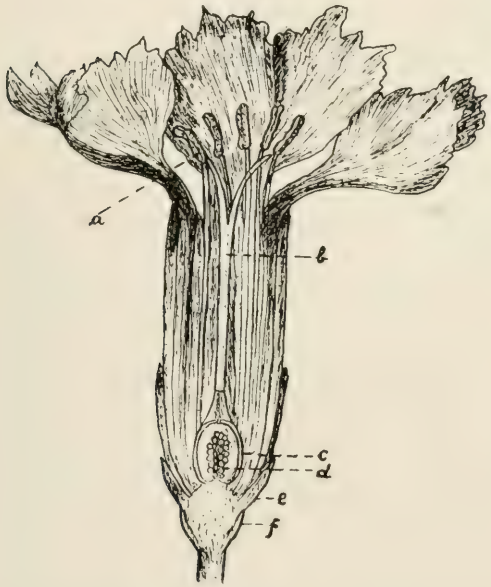
The same may be said of the habit of growth, although not so much attention has been paid to this feature. One extensive breeder has produced a strain with an open, upright growth, producing very few shoots along the flower stems. In some of the varieties this characteristic is so pronounced as to be a detriment, as no young shoots appear until the flower is cut, causing a much longer period between crops. Such plants do not make good stock readily in the field, and do not meet with favor in the eyes of the commercial growers. A free branching habit should be the aim. A plant that starts young shoots from the lower portion of the flower stems about the time the bud is half grown, will give the most continuous crop of blooms. Those that are what is known as grassy will bloom scantily until toward Spring, throwing a heavy crop of blooms at that time. This is a partial reversion to the original type and such varieties should be avoided when crossing.

The act of pollinating, or transferring the pollen from the anthers of one flower to the stigma or stigmas of another, is quite simple, a little experience in the work being sufficient to guide the operator. Of far greater importance is the selection of the parents, as intimated above, even after the pedigree has been established.

It must be kept in mind that the perfect Carnation is made up of numerous parts, any of which may be perfect or imperfect, without in the slightest degree affecting the others. It is well known that a weakness in a parent is apt to be aggravated in the offspring, unless counteracted

by unusual strength in that particular section in the other parent. For instance, a variety possessing a poor calyx should never be used except in connection with a variety that never splits. A tall, slender grower should be crossed with a more bushy one.

It has been stated that the male, or pollen parent, exercises the greater influence over the color of the seedlings, while the female, or seed parent, dominates the habit of growth. We have not been able to verify this, although we have observed carefully. For this reason we frequently make reverse crosses.

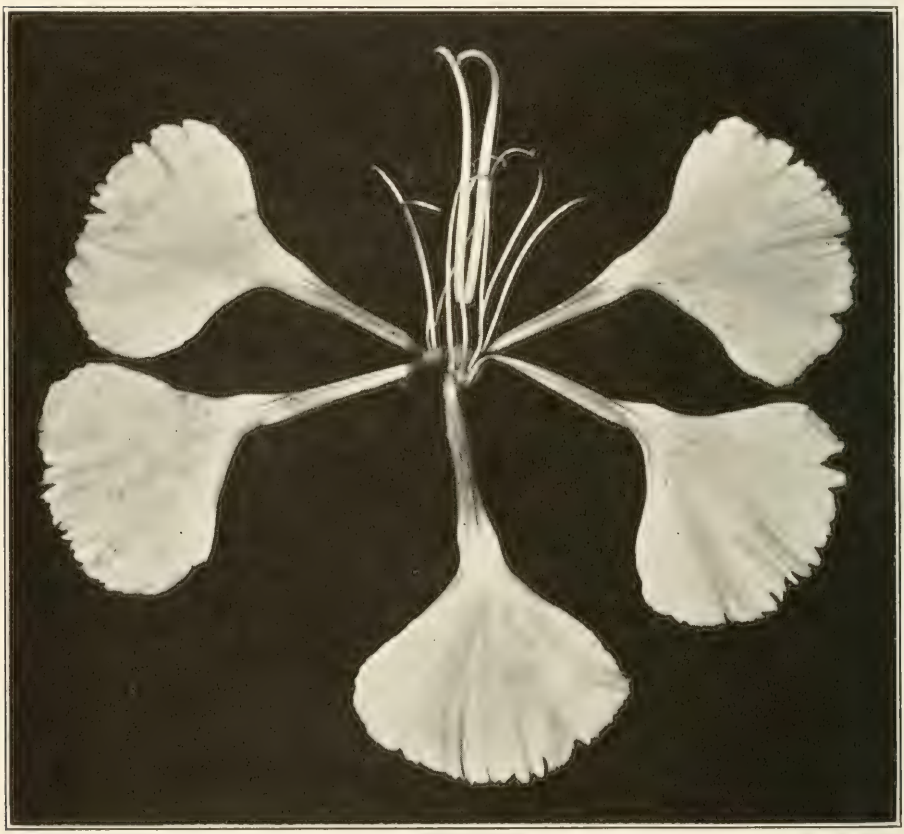


SECTION OF A DOUBLE CARNATION SHOWING REPRODUCTIVE ORGANS AND OTHER PARTS

a, anthers; b, style; c, ovary; d, ovules e and f, bracts

Having selected the varieties that are to be crossed, the first thing to do is to prepare the flower that is to bear the seed. This should be done as soon as the petals are unfolded and before the anthers, which bear the pollen, have burst open. Pull out all the center petals and remove the anthers to prevent self pollination. In a few days you will notice a fuzzy growth along the upper part of the stigmas, of which there are usually two, but frequently three, and sometimes even

four. A piece of glass and a camel's hair brush are usually employed to transfer the pollen, but we use our thumbnail and a dull knife blade, which we find more convenient and just as efficient, care being exercised not to injure the stigmas.



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SINGLE CARNATION SPREAD TO SHOW SEXUAL ORGANS AND PETALS

Before doing any crossing, the operator should make a careful study of the structure of the pod containing the tiny ovules which, when fertilized, will produce the seed.

He will notice inside the shell a tiny cob, not unlike a corn cob. This is covered all around with the tiny ovules, just as the corn cob is covered with the grains of corn. From the tip of the cob there is a thread leading to each stigma and through which the life passes from the pollen to the ovule. Inasmuch as each ovule represents a unit and is fertilized independently of the others, it stands to reason that a liberal application of pollen is likely to produce a well filled seed pod, although it is a recognized fact that some varieties produce seed more freely than others. There are varieties that will not produce seed. Others will not produce pollen, while most varieties produce both.

Care should be exercised when watering to keep the pollenized bloom dry. If fertilization takes place, the flower will go to sleep within three days, at which time it is advisable to slit the calyx in such a manner that no moisture may collect to rot the seed pod. Each pollinated flower should be tagged, giving the parentage and the date of pollinization.

We have found little, if any, difference between the percentage of successful crosses, according to the time of the year the cross was made, but there are other reasons why late Fall or early Winter are the most desirable for this work. It should be done while there are no bees around, else your record tags will be of little value.

It will require from six to ten weeks for the seeds to ripen, at which time you will notice the shell taking on a brownish tint. Do not leave the pod on the plant until it bursts open, else you might lose some of the seed, but gather a few days before, taking a few joints of the stem along with it. Place in an envelope until well ripened and then sow in a light, well drained soil, covering the seeds about one-eighth of an inch deep. In about eight days

germination will take place and the watering during this time should be done very carefully to avoid damping off. We like to sow the seed about March 1, as that gives enough time to grow nicely established plants by planting out time at the end of April. As soon as they are large enough to handle, pot the seedlings into small pots. We prefer potting to pricking into flats, because the young plants can be treated more individually in case of damping.

Usually these plants are set out in the field and are allowed to bloom outdoors in late Summer or early Fall, each one being labeled when in bloom and later brought inside. This is, no doubt, the most practical method where large quantities are handled, but if the number of seedlings does not exceed a thousand or two, we prefer to flower them inside in pots. We find that but little idea can be gained from the flowers that are produced outside. Colors that seem good out of doors may come pale and washy in the greenhouse in the Winter months, and vice versa. The same may be said regarding the calyx and form; while no dependence can be placed in the stem as it is produced out of doors. We find it possible to get a far better idea of the merits of a seedling from a bloom that is produced under Winter conditions, and as stated above, if the number of plants to be tested is not prohibitive, we prefer to handle them in that way. Pot them into 4 in. or 5 in. pots, allowing them to run to flower when they get ready, which is usually in the late Fall or early Winter. When a vigorous plant in a 4 in. or 5 in. pot runs up to one flower in the late Fall, if there is any inclination to split the calyx it is apt to show it. The presence or absence of young shoots around the base and along the lower part of the stem will give you an idea of the style of the growth. Then, too, you have better control over the plants. We have

seen what were considered the most promising seedlings lost in the process of transferring from the field to the house. Not so with the pot culture. (It might be well to state here that no seedling should be discarded until it has bloomed unless the plant is seriously diseased, for any one of them might be just the one you aimed at when you made the cross.)

As soon as a comprehensive idea can be gained from the bloom, the plant should be labeled and set aside if meritorious, or discarded if unworthy. Each plant is given a number, which is written on a label along with the color, the parentage, and the year the cross was made. If space is available, these plants may be planted on the bench, where they will make cuttings freely, frequently throwing up additional flowering shoots, which will confirm or contradict the original estimate of their merits.

During the propagating season all the good, strong cuttings are struck for testing the following season. Great care should be exercised in the selection of these cuttings, only such as will perpetuate the vigor of the original plant being taken. Over-propagation has caused the downfall of many a promising sort. The number of cuttings taken from each plant will vary according to its habit of growth, but usually from six to a dozen cuttings is considered sufficient for the second year's trial. If the variety is considered worthy of further trial, these plants will give enough cuttings to fill a nice block of space on the bench.

With the second year's trial the real task of selection begins. Many will show characteristics that will cause a complete reversal of the original estimate placed on their value, while others will confirm or even improve on the first year's showing. A good idea, we find, is to keep records on each variety in a pocket notebook. Each variety is

WINSOR, LIGHT PINK. GOOD FOR SUNNY WEATHER

given a page and from time to time, beginning with the first bloom produced in the Fall, records are made of the color, size, form, stem, calyx, the growth of the plant or any other point bearing on the value of the variety. It is, of course, essential that these records be absolutely correct, else they will be of no assistance in selecting the varieties for further trial.

By Midwinter a fairly accurate estimate may be had of the varieties on trial and propagating is again resumed. This time the number of cuttings taken is gauged by the estimate placed on its value. During the third year, in addition to the verification of the second year's records, we add a record of the number of blooms cut, for the purpose of comparison with our records on the standard sorts. Unless a new variety will give a sufficient number of blooms, be they ever so fine, it will not pay the commercial grower to plant it.

STANDARD OF POINTS FOR CARNATIONS

In order to be able to form a correct estimate of the worth of a variety, it is necessary that the grower possess a thorough knowledge and excellent judgment. He must be able to weigh correctly the merits against the defects, as every variety does possess some of both. There is perhaps no better method than to employ the scale of points as arranged by the American Carnation Society. If a fair scoring will give a total of eighty or more points, the variety possesses at least some merit, and should be given further trial. This scale is arranged according to the relative value placed on the different parts in making up a perfect bloom, and was worked out by the leading Carnation growers.

Color is placed first with 25 points. Unless a flower

possesses a pleasing color it is of little use, as it is the color that first of all excites admiration. The color should not only be pleasing, but it should be pure in tone. White should be as white as it is possible to get in a flower, and the petals should be free from flaking. The lighter shades of pink should contain enough yellow to prevent bleaching, and the cerise shades should contain enough scarlet to hold their brilliancy. There are two distinct shades of scarlet. The light or orange scarlet, as seen in Scarlet Glow, and the deep red, as seen in Adonis. Either of these possesses a brilliancy that is practically unaffected by age. The crimson, which is really maroon, should contain enough scarlet to light up under the rays of sun or artificial light. A yellow should be clear and of a golden hue, the best so far being Yellow Prince. Self colors are considered of greatest value, but a well marked, striped or flaked variety has its uses. Any color that is pleasing to the eye is worthy of a place.

The size, which carries 20 points, should be as near four inches wide as possible. Blooms that measured over four inches have been shown, but they have invariably proved to be freaks, or overfed. Four inches is still the standard for size.

The calyx, which carries five points, should be so formed as to hold the flower firmly and without bursting.

To the stem is allotted 20 points. It should hold the flower erect at all times. It should be 3 ft. long by January. It should be wiry and tough, and not snap too easily at the joints.

Substance carries 15 points. The petals should be hard enough to withstand, without bruising, the necessary handling in the markets. The blooms should also keep in a fresh condition a reasonable length of time without going

to "sleep," i. e., withering. Thick, waxy petals do not always denote keeping capacity. Only by careful test can the keeping qualities be determined.

Ten points are given to form. The petals may be either serrated or smooth edged, but the guard petals should lie flat and at right angles with the calyx, overlapping enough to form a perfect circle in outline. The center should stand above the calyx one-half the distance of the diameter of the flower, forming a half sphere. There should be just enough petals to fill the center comfortably without crowding.

Fragrance is given only 5 points, not that it is not considered a desirable attribute, but because it is so variable under different conditions. While the trade refuses to place a proper market value on fragrance, the breeder should strive to develop this feature which we consider one of the Carnation's greatest charms. That spicy odor is inalienably associated with the Carnation in the public mind and should be developed.

Having satisfied yourself that you have a variety that shows improvement over existing varieties, you proceed to work up stock for the purpose of distribution among the trade. It is essential that you continue the most careful selection of the cuttings, in order that the variety's vitality shall not be undermined.

CHAPTER XIII

Exhibiting and Judging Carnations

In selecting blooms for the exhibition tables, one should endeavor to get every flower as nearly alike as possible. Color should be the first consideration, with size next. Nothing detracts from a good vase of blooms more than a few off colored or faded ones mixed in. It does not matter how good they are in size, badly colored blooms will surely kill the whole lot.

Size, of course, counts to a great extent, and we are of opinion that judges often err in placing size before every other consideratoin, especially before a good, compact bloom. The writer's ideal of a good Carnation for the exhibition table is Rosette. It is quite large enough. It is of perfect form, good substance and stem, and has grand keeping qualities, which, of course, is accounted for by its substance.

Next to size we place stem. The stems should be selected as evenly as possible, straight and long, without getting down on the plant too much, or into the hard wood. When hard wood is cut the blooms will not keep; it is impossible for them to assimilate sufficient water.

Fragrance, of course, is always acceptable in Carnations, but is not necessary. How many of us consider fragrance when looking over Carnations? If everything in form, color, stem and calyx is good, never mind fragrance, so far as exhibiting for prizes is concerned.

LIGHT AND GRACEFUL ARRANGEMENT OF CARNATIONS AT AN EXHIBITION

In the matter of cutting the blooms the writer always selects the blooms at least 48 hours before starting them on their way to shows. This gives them a good chance to get filled up with water and they are harder and better able to withstand 36 or 40 hours in boxes. In packing for the trip, corrugated boxes are used, 42 in. to 48 in. long, the flowers placed in layers, with tissue paper over each layer, and damp newspapers over the stems. Never damp the blooms, or make the paper too wet. We have yet to report a failure by this method. There will be three layers to each box, or from 150 to 200 blooms. When arranging them for the exhibition, be sure that the water is not ice cold. We like to set them in water that is moderately warm at first, then later place them in colder water in time for the judges to pass upon. Flowers that were to all intents sleepy when unpacked, revived to a very great extent by this method.

One gets lots of pleasure by exhibiting, gains lots of knowledge, learns other people's ideas, especially so from the judges. It is fun to see how the same judges will change in ideas from one year to another; it keeps one guessing what to expect will take their eye from one year to the next. But we know of no other way in which one gets so much in touch with all that is good and beneficial, both in pleasure and business, than by exhibiting. It is an incentive to grow better flowers. If we are beaten we go home declaring we won't be licked next year. If we win, so much the better. What better inducement can we get to excel with our favorite flower from year to year?

A new departure in the method of exhibiting Carnations in America was inaugurated at the National Flower Show at Boston in 1911. A class was there formed calling for " The best display of Carnation blooms, covering

Basket Exhibit of Carnations

150 sq. ft. of space, to contain not less than 1000 blooms nor more than 1500 blooms." The quality of the flowers, the artistic arrangement and general effect were to be the points considered in making the awards. Decorative green of any kind, including plants, was permitted, and the prizes were $200 for the first, $100 for the second, and $50 for the third.

This induced strong competition in which much diversity of taste was in evidence, and much skill in the decorative effects produced. In each case an ample ground work of greenery was formed, mostly of the choicer kinds of Maidenhair fern or Nephrolepis. Adiantum Farleyense, as fine specimen plants over dark velvet, was used in one instance, while tall glass vessels, filled with graceful masses of Carnations, each representing one variety, was another feature. Bowls of blooms set on pedestals, and long arches with baskets or bowls of Carnations fastened thereto, formed the scheme of yet another. The canopy idea was also well utilized, with other means to enhance the grace and to show the value and beauty of the respective varieties without any crowding in the general arrangement.

A bold scheme of contrasting colors can be very well employed, such as a scarlet against a white, or scarlet, white and pink, but a conglomeration of colors is to be avoided. Pink varieties in several shades, with white and a lesser number of reds, but each shown in a separate vase, usually go well.

In these arrangements for effect we must get away from the heavy, packed arrangement inalienable from the use of the ordinary exhibition vessels of upright form. Glass jars of various diameters and lengths are ideal for a Carnation exhibit for effect. Very graceful bamboo stands and other contrivances are also utilized, but a background

Courtsey *Cassell & Co.*

SHOW BORDER CARNATIONS "DRESSED" AND "COLLARED" ON BOX STAND

of some neutral or dark color in plush or velvet, or even green baize for lack of anything better, should be employed, as the Carnation is too " thin " a flower to look well without this support or foil. The American Carnation Society adopted a dark bottle green color for its vases at its annual meeting at Cleveland in 1914. These vases, as is well known, are about 8 in. wide at the mouth and 16 in. high to hold 100 blooms, and proportionately less for half that number.

It used to be the custom and is still, though to a less extent, at the English shows when fancy blooms of the Border type were exhibited, to show these on boards or boxes, which were 30 in. by 18 in., 4 in. deep in front and 9 in. deep at the back. One of these boxes containing the flowers is here illustrated. The flowers are shown with a circular white card or collar beneath them, with the idea of throwing up the color, and at the same time supporting the bloom. These are made of white cardboard with a circular hole just the size of the calyx. Through this the bloom is taken, the cardboard being adjusted just beneath the petals. The outer petals are flattened upon this cardboard, while the central ones are arranged in regular order more or less flat, successively, in true symmetrical form. The idea is to get a smooth, faultless, round flower. Any superfluous petals, or any indeed the least malformed or small, are taken out by means of tweezers. Such blooms when " dressed " are then supposed to be ideal for the judges. Fringed flowers are never allowed in exhibits of these Border varieties.

During the last eight or ten years, however, there has been a distinct and increasing tendency to exhibit the blooms naturally, without any dressing, and in vases.

A Non-Competitive Exhibit of Carnations at a London (Eng.) Show, by C. Engelmann

Bouquet of Carnations

CHAPTER XIV

Best Type of Greenhouse

It is unanimously conceded that the greenhouse of 100 per cent. efficiency for Carnation growing is the house to which the word "general utility" can be applied. The detached even span house of iron frame construction, or what is termed "reconstructed construction," having concrete sides and cast iron sills, has been universally proclaimed to be the last word in "safety first" greenhouse construction.

Opinions differ radically among growers as to the most economical width at which to build, but undoubtedly the 37 ft. to 48 ft. house comes nearest the true economical ideal. But houses up to 78 ft. wide are in favor. On the best modern type iron frame greenhouse, all strains have been carefully calculated, every part and every connection being made amply strong with the proper safety factor, so that there is absolutely no chance for failure. Foot pieces are made heavy and broad, and in such shape that when embedded in concrete they are held so rigid that there is absolutely no danger of disturbance by the reflex action which occurs in heavy winds.

In deciding in which direction the ridge shall run one has to be guided by the individual available location, but the ridge running east and west and 26½ deg. pitch roof, will give the best success.

Wide houses are infinitely preferable to narrow ones and have everything in their favor. Better to build a

wide house not so long than a narrow house. The wide house can be added to as circumstances permit, which is much cheaper than rebuilding the narrow ones. In wide houses the volume of air is increased, which is one of the elements to success. The plants grow better in every stage and are not liable to suffer so much from the sudden variations of the temperature due to outside influences. The cost of heating the wide span house is also cut down considerably over the same area of ground space covered. The heat can be better and more economically applied. Ventilation at the ridge can be given without danger of a downdraft on the plants. It is essential to the welfare of the plants to guard against any sudden rise or drop in the temperature owing to outside influences, and this is almost unavoidable in narrow houses. The lighter the house, the better the results; a better grade and greater quantity of blooms can be cut.

A striking illustration of this was afforded the writer during a typical late Winter day. It was a clear, bright morning, followed by a sudden drop in temperature and a snowstorm at noon. Visiting one of our genial and most successful florists who at present has modern wide houses, the advantage of the wide, versus narrow, house was discussed. "Wait and see," was his comment. At 4 P.M., snowing fast, the thermometer stood correct for Carnations, and with still a crack of ventilation at the ridge and the fires untouched. On returning home where similar conditions had prevailed, the narrow houses, it was found, had been closed tight and the fires started before twelve o'clock.

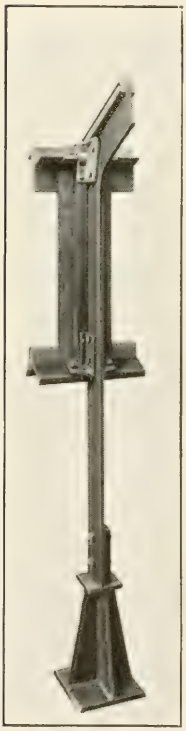
Permanency is the keynote today looking to the minimum of upkeep and depreciation. Growers agree that the best house is none too good, and a poor thing is dear at

any price. With the enormous capital being invested in greenhouses it behooves the investor to acquaint himself thoroughly with the several merits of the different constructions and build the best, for the watchwords should be not how "cheap" but how "good."

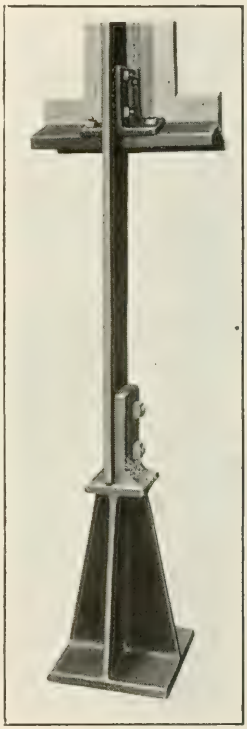
It has been contended that the general tendency on the part of the greenhouse builders has been to lighten the several members at the cost of safety with the idea of keeping down the price. Whilst this might apply to some constructions, safety first is the rule of thoroughly reputable firms. The material benefit accruing from modern wide houses cannot be underestimated when compared to heavily constructed houses with too much ironwork, and especially is this applicable in the matter of upkeep and depreciation.

The modern house shown on page 218 is of the "reconstructed construction," having concrete walls and capped by a cast iron sill (see illustrations). It is also built with approximately 12 ft. spacing of the rafters. Any sized glass can be used as in the old construction. If 16 in. wide glass is desired, each bay is arranged for nine lights. If 20 in. lights are desired, each bay is arranged for seven lights, the combined shade being less in this type of house. Machine-made double thick clear glass only is used in this type of house. The columns and connections are 50 per cent. less than the older spacings, which are approximately 8 ft., and it impresses every one as being far superior in design and strength in every way. The posts and rafters are in one piece, bent to the pitch of the roof, the iron being heated before bending and afterward allowed to anneal properly. It is evident that a combined post and rafter of this character is stronger than it can possibly be by welding or plate connection. Where it is necessary to

piece the rafters, owing to the size of the house, this is done over the columns and it simply means a butt splice where the strain is less and easier to take care of. The footings of these rafters, which are shown in the cut, are embedded in a concrete pier. Circular or pipe columns are used, as the strain on such a column is spread equally in all directions, consequently the members should be equally stiff in all directions. The one objection to the pipe column is that it rusts on the inside, but this has been entirely over come by steeping the columns in paint before shipping, or by galvanizing, which is preferable. The cast iron anchor base for these is also illustrated. Some growers prefer the angle or I-shaped columns. The objection to these angles is that it is almost impossible to get a uniform section so that its resistance to strain is not equal in different directions. This leads to a certain vibration in one direction, which is objectionable. All braces are put together before being shipped from the factory, which facilitates the work of erection and also reduces to a minimum any possibility of inferior workmanship of which however, no reputable firm would be guilty



Cast-Iron Anchor Base



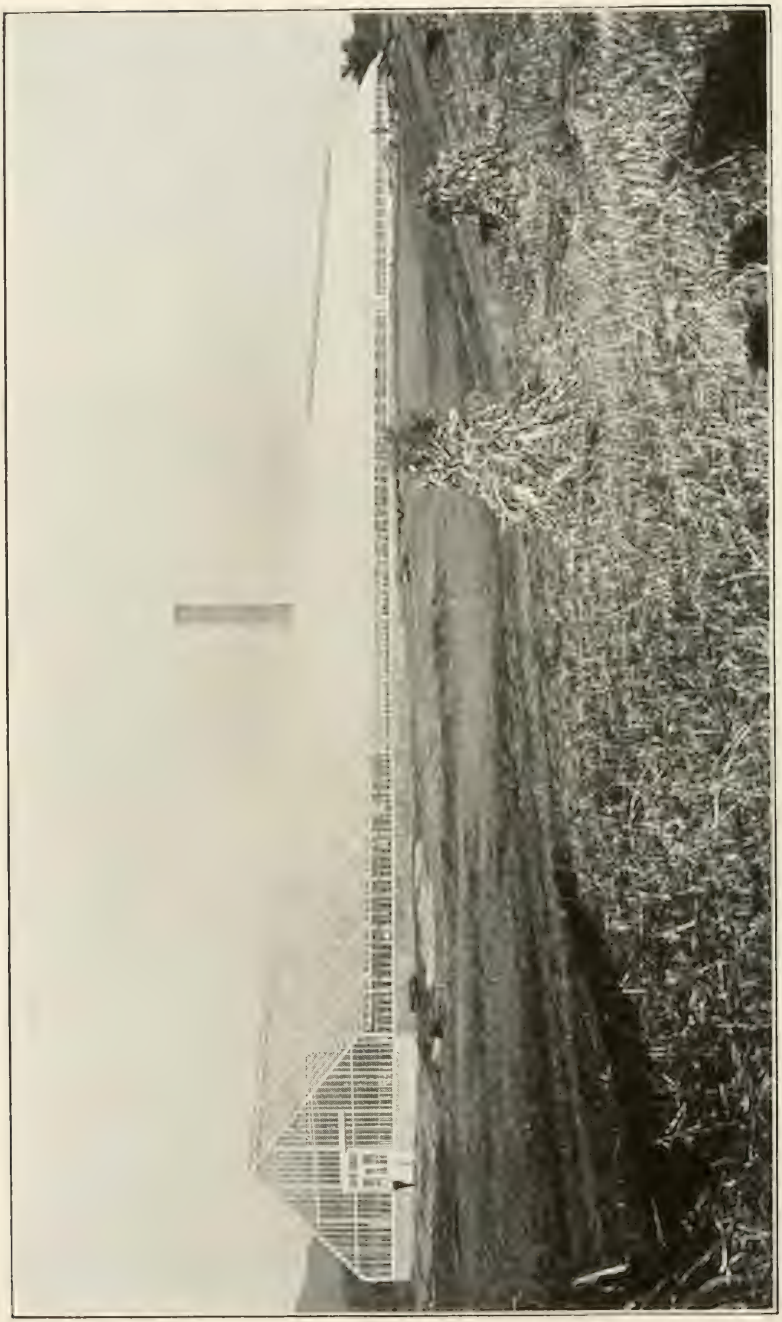
Column Strongly Bolted and Clamped to Base and Iron Sill

The combined "Z" bar eaves plate and drip gutter, as shown on page 220, is proportioned to shed the rain clear of the superstructure, and the drip gutters forming part of the eave materially strengthens this part of the building and completely overcomes all the objectionable sagging features so well known to growers of the galvanized gutter that is attached by strips to the glazing bars, or the wood gutters which are used in some constructions.

Ventilating is done at the sides by a line of transom or sliding sashes operated by two gears placed in the center of the house. This method of side ventilation reduces to a minimum the possibility of excessive draughts on the plants, and also reduces the labor of manipulation to a minimum, and whilst the labor question is of vital importance and is one of the chief elements in favor of the larger houses, growers must more or less be guided by common sense and experience. Long runs of roof ventilating have been tried, and from the construction point of view are an unqualified success, but there is a general tendency on the part of some of the best growers to recede to the medium length of run operated by the worm gear. For large houses a run of 50 ft. to 72 ft. lift, operated by one gear, will be found to be the most practical and the safest.

The gables are so braced as to withstand the shock of the severest storm. These are furnished with double sliding doors where necessary to allow of teams being used in the filling and emptying of the houses. These "general utility" houses, to which this appellation can well be applied, can be used equally for Sweet Peas or Roses, provided the necessary heating arrangements are adequate to maintain the required temperature.

For growers of limited capital the semi-iron construction up to 35 ft. wide is not so expensive as the iron



A Modern Carnation House, 60 feet by 400 feet

frame construction. But the difference in cost above this width is relatively so small as not to warrant the semi-iron construction. All-wood constructions are practically out of date. But whatever house is built, success must necessarily, in the long run, depend on the skill of the individual grower.

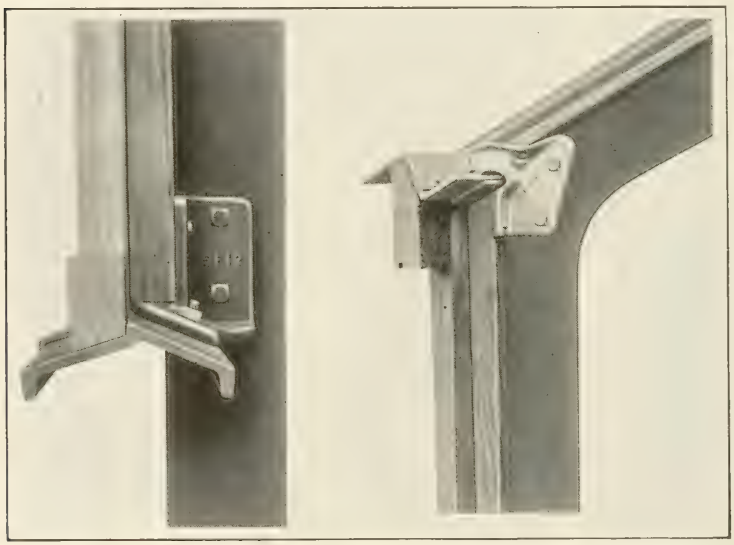
PROPAGATING HOUSES

One of the most important adjuncts to the successful cultivation of Carnations is a suitable propagating house. For the average establishment there seems to be no apparent necessity just yet to break away from the old, time-honored lean-to on the north side of another building or wall. Where the width will permit, a bench can be at either side of a walk of sufficient width to permit of a wheelbarrow being used to facilitate the work of taking the sand in and out. These benches should not be more than 3 ft. in width. Such a house is more easily managed and regulated as regards watering and temperature; watering and spraying is reduced to a minimum, thus diminishing the possibilities of the development of cutting bench fungus. Where the benches are built of cypress, take the ordinary precaution of drying-out the bench for a few days after being thoroughly washed down preceding a crop, and give it a good coat of limewash, adding to each pail of limewash a handful of flowers of sulphur.

The heating pipes should be under control and carried on stringers attached to the legs of the bench or on a hanger strung from the cross bearer. This permits of a better distribution of the heat than when carried along the legs of the bench. The best bench is one constructed of concrete, with either flat, porous tile or brick bottom.

If this type of house is not possible in connection with

a modern range of wide, even span houses, a suitable location must be selected for a narrow, even span house, about 11 ft. wide, having benches on each side. This allows of ample walk space. The fronts of these benches, as in the lean-to, can be boarded in and "shutters" placed at intervals to allow of proper manipulation of the heat. Some of the largest growers who make a specialty of supply-



CAPPED IRON SILL "Z" BAR EAVES PLATE AND DRIP GUTTER

ing rooted cuttings by the thousands favor the even span house, or a house having a short span to the south, or even a long span lean-to with benches running either lengthwise or crosswise of the house. Closer attention must be given in these houses in the matter of watering, spraying, shading and heating than in the case of the usual narrow house or lean-to with the northern aspect.

KINDS OF BENCHES

What is the best type of bench? This is an open question. We believe that pecky cypress benches, with bearers running longitudinally and bottom boards crosswise, will give the best and most economical bench for the commercial grower. The approximate price of an all-cypress (not pecky) bench in large houses is 22c. per sq. ft. erected. Such a bench will, with proper care, last at least eight years. Of course, the cypress bench needs more attention at the end of each season. Some growers contend that the wood bench is a great harbor for sowbugs. The risk of bench fungus is ever present, too. Yet only in advanced stages of decay does the former apply, and the latter is a negligible quantity if the benches are thoroughly washed down with a good force of water, and a coating of limewash is applied.

In some localities, notably in Pennsylvania, the dearth and expense of requisite materials to build concrete benches makes them prohibitive. Then should it become necessary to utilize the house for different subjects or if building or remodelling is necessary, the concrete beds that are made solid would have to be broken up at considerable expense.

Unquestionably the best bench for Carnation growing is made of iron and tile, such as is generally used in private gardens, but the initial cost and upkeep make this prohibitive for the florist.

The next best bench, and which is the nearest approach to the iron and tile, is the raised bench having porous tile bottoms and either concrete or wood sides. Most growers agree that Carnations planted in raised benches can be more easily manipulated and taken care of as regards watering and attention.

Where time and circumstances permit, a very satisfactory bench is one with the sides of concrete, of suitable width and height, and the space between filled in with soil or other suitable material, beaten down hard, level with the walls. On this, either round or square porous drain tiles are placed plumb with the edge of the wall, or overhung sufficiently to allow the heating pipes being carried underneath along the walls. This method permits a very neat and convenient arrangement of the heating pipes. The sides can be either of wood or cement as shown in the illustration on page 224.

Some successful growers favor the "solid" bench of various heights; a few the "ground bed." The adoption of these is probably advisable at times on sloping land, but our experience leads us to the opinion that while long stems and good quality of bloom are obtained, it is at the expense of quantity.

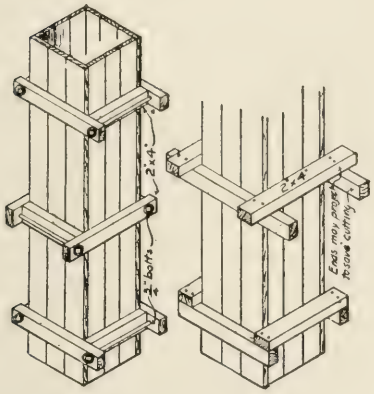
CEMENT BENCHES

Cement has been used for many building purposes in recent times, and more latterly florists have made free use of it for the construction of benches in greenhouses. Although the initial cost is greater than for wooden benches, yet when once erected the cement bench lasts one's lifetime. If the grower has a supply of clean gravel at hand he should have little hesitation in adopting the cement bench, or well sifted rough cinders can also be used, but not fine ashes.

If the grower makes his own benches, as can easily be done with a little skill on his part, it would be well for him beforehand to look around and purchase a quantity of flooring or old timber, which may sometimes be had cheap.

The first necessity is the posts, which can be formed in a mold similar to those shown in the accompanying cut.

The form at the left is more economical where it is the purpose to use it many times, as it is fitted with bolts which can be unscrewed when the cement has set. The one on the right shows the boards nailed together, and in that case the nails have to be knocked out. The bolted mold is the one recommended. Such posts can be 4 in. x 4 in., or 3 in. x 4 in., and 30 in. long and well anchored, and may be reinforced either by an iron rod or by wires. Iron piping is perhaps the best. For the sides of the benches, wires or bent iron rods may be used, rods also being used for reinforcing the bottom of the bench. A part of the rod should be left protruding to grip the sides when they are added. Their top edge will be about 3½ ft. from the ground, unless, of course, where solid benches are used. The sides then rest on the ground.



MOLDS FOR CEMENT POSTS
(*See text*)

The molds are made in sections of say 6 ft. or 8 ft. in length and the desired width, say 3½ ft. or 4 ft. Four inch flooring is sufficient to support the weight of the 2 in. layer of cement without any sagging. The wires spoken of should be laid at equal distances apart, and their positions marked so that before the cement sets hard, drainage holes can be pierced between them. Side molds of a depth of 8 in. or 9 in. are easily made, and can be held together readily by means of cross pieces lightly nailed over the top.

Procure the Portland cement in bags, and use extreme

care not to get it wet either in transit or in storage, as once wet it sets and is unfit for use. Mix the concrete mushy wet in the proportion of four parts of gravel and sand to one of cement, and do the work quickly. All the gravel (or cinders) ought to be clean, and if possible have sharp angles.

View of Side of Bench Showing Cement Base, Tile Bottom and Strongly Braced Wooden Side

Trap, granite, and hard limestone are among the best materials for mixing with Portland cement to make concrete. Soft materials should be avoided. All particles passing a quarter-inch screen may be considered as sand. In regard to water, any good tasting drinking water is suitable for the mixing. This is done on a wooden platform with shovels, and when filling in the concrete see that no vacuum is left, but puddle it in and make it smooth by means of trowels. The forms may be removed after the concrete has set four days. Recently the firm of McCaslan Bros. at Zanesville, Ohio, patented their sectional concrete slabs and construction for greenhouse benches, and the excellence of these sections is at once apparent on glancing at the accompanying illustration.

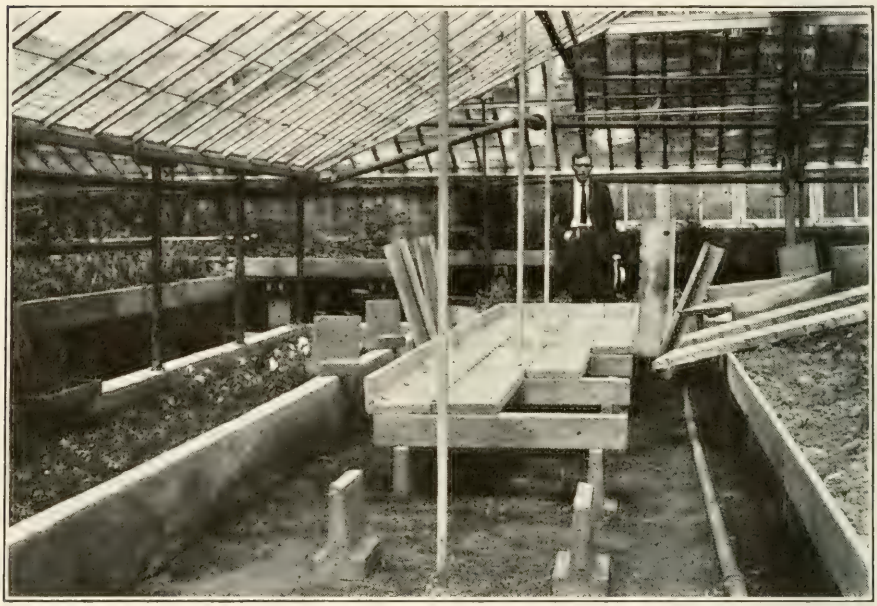
BENCHES FOR SUB-IRRIGATION

At one time this form of watering was much discussed, but owing to the cost of installing suitable benches for sub-irrigation and the care necessary in handling the beds, it never became the success it was at first thought it would. Experiments were originally made at the Ohio Experimental Station. The idea is simply that of the pot and saucer, where water is filled in the saucer and rises by capillary attraction through the soil in the pot. It is Nature's plan, and good when properly understood and when experienced care is exercised.

Benches provided with sub-irrigation save the time of three or four persons so far as watering is concerned, and finer plants result in the case of some varieties. One watering lasts double the length of time when placed underneath than when put on top. Yet it was held that on the balance of cases as good blooms could be grown by means

of surface watering as by sub-watered benches and at less risk and expense.

The plan adopted was to form long, shallow "tanks" upon which were placed lines or rows of porous bricks, tiles, or coarse ashes, and the water was let into this shallow tank through pipes in the side. Such water passed rapidly through the ashes or brick or tile to the soil of the bed or



McCaslan's Sectional Concrete Bench in Sectional Slabs

bench which lay immediately above. Half an inch of water would be soaked up in five or six hours in a 3½ ft. bed. One advantage arising from these sub-irrigated benches was that the heating pipes could be placed immediately under them, and in that way the soil was always kept nicely warm. But with the use of cement benches this can be carried out without the need of any provision for holding water at the bottom.

The cost of building sub-irrigation benches properly is two or even three times as great as for the ordinary cypress bench, and as varieties differ in their likes and dislikes it was found also that some did markedly well by sub-irrigation, while others did not. The cost of a surface watered or ordinary bench may be taken at 22 cents per square foot; the sub-irrigated bench would cost $1.50 to $1.75 or even $2 per running foot, complete, according to the locality. It was this question of cost perhaps more than anything else, and the lessening returns from cut blooms, that influenced the growers to retain the old type of bench as against the sub-irrigated one.

Heating and Fuel

Regarding the amount of radiation required to maintain a given temperature in a greenhouse, there is no hard and fast rule that can be applied in all cases, since so much depends on the type of house, location, size and method of glazing. As a general rule, the following table, giving the lineal amount of 2 in. pipe for hot water heat, with water at a temperature of 160 deg.; also the square feet of steam radiation at 5 lbs. pressure, will show how much is necessary to maintain the temperatures as stated, when the mercury outside is at zero. These amounts are based on the requirements of a greenhouse 100 ft. x 30 ft., with cement walls 2 ft. high, 4 ft. of glass on each vertical side, height of ridge 13 ft. 6 in., and both ends glazed and exposed:

Temperature	Lin. ft. 2 in. pipe	Sq. ft. of steam pipe
45 deg. to 50 deg. Fahr.	1798	460
50 deg. to 55 deg. Fahr.	2071	530
55 deg. to 60 deg. Fahr.	2372	608

The position of the boiler is very important. Choose a location that will be central even if additions have to be made to the establishment. It must also be accessible, and if located in a boiler house this should not be so placed as to cast a shadow over the greenhouses. The smoke-stack should likewise not be in a position to throw a shadow, and if at all practicable should be away from the direction of the prevailing winds, otherwise smoke and soot will be thrown over the glass. A stack 10 in. in diameter is suggested by expert heating engineers for anything below a 10 h. p. boiler. If a 50 h. p. boiler is used a 20 in. diameter should be built. The height of the stack will vary between 25 ft. if soft coal is burned, and 50 ft. for hard coal.

Steam is employed in all places over, say, 40,000 or 50,000 sq. ft. of glass. If hot water is used, the force system is preferable to the gravity system; excavations for the boiler are then seldom necessary, thus saving labor and expense. With the steamtrap system some dip or excavation would be essential in order to catch the water of condensation.

As to boilers, it is important that these have a deep fire box, that is, deep from the top to the grate, so that all the gases from the coal may be properly consumed. Automatic draught regulators are advisable. Sectional boilers are excellent inasmuch as they can be added to as the area of glass increases. In any case, the most efficient boilers are those that give the longest passage for the heat, flames, or burning gases over the water area, or tubes of the boiler. Thin waterways are quickly heated, but they must, of course, be strong enough to last a reasonable time and prevent bursts. Sectional boilers should be covered with asbestos.

In regard to fuel, records show that an average of 18 to 20 tons of anthracite coal was the amount used during an ordinary firing season of seven months, November to May, for a greenhouse having 3000 sq. ft. of exposed glass, to maintain a temperature of 55 deg. to 60 deg. This would be at the rate of six or seven tons per 1000 sq. ft. for the Winter and Spring seasons to maintain a temperature suitable for Carnations.

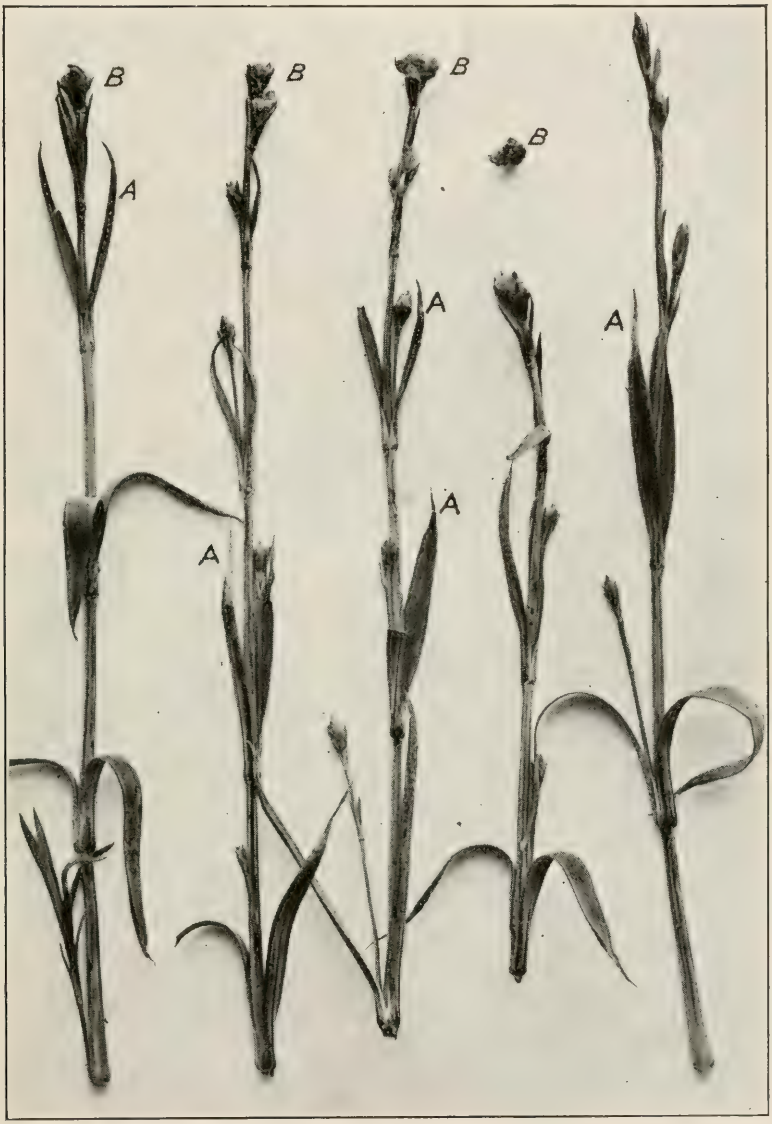
The price of coal varies, but in Pennsylvania hard or anthracite coal costs in the neighborhood of $5.50 per ton, carload lots; soft or bituminous coal costs about $2.75 or $2.80 a ton, carload lots, f.o.b. mine. The users of bituminous coal should endeavor to place their orders in the early Spring direct with the mines or their authorized agents, and demand that the coal selected shall be of even quality throughout the whole shipment, necessitating the order being filled from the same mine. Several growers can sometimes purchase co-operatively and so secure discounts. In many ways this is a businesslike proceeding. An analysis of the coal can also be procured, and protests have force and advantages are gained by means of co-operative buying.

The analysis of a good, soft coal applicable for florists' use is as follows: Volatile and combustible matter, 20 per cent. to 30 per cent.; fixed carbon, 65 per cent. to 75 per cent.; ash, not over 7 per cent.; moisture (when weighed) not over 1 per cent; British thermal units, 14,300. Soft coal has little effect in clouding the glass of the houses with soot and dirt if the chimney is sufficiently high. If anthracite is used, choose the larger sizes if no night fireman is employed, or where a low pressure is carried. Where a high pressure of steam is necessary the smaller and cheaper grades can be used economically, but this necessitates a

chimney of sufficient height to create a good draught, but the chimney should be so situated as not to suffer from natural currents blowing over it, if this can be avoided. Such currents arise from the presence of nearby hills and sometimes cause downdraughts.

In the choice and use of fuel every precaution should be exercised to see that your good money is not being blown up the chimney. The whole question of the choice of boiler, the heating arrangements, and the proper use of fuel and of careful firing, is one of the most important as to the profit or loss on his business that the grower has to consider. The notes in this chapter are therefore not to be taken as exhaustive, but merely suggestive, and expert advice, or the advice of some one of experience, should be procured before going into any large contract in regard to heating.

A considerable saving of fuel is effected when the heating is done from a central plant, and the boilers, mains, and other pipes properly placed, and insulated if necessary. Examine occasionally the furnace or combustion chamber to see that it is not getting clogged. Blowing off the steam boiler once a week is advised. A good fireman means much to the success of any plant growing concern.



RESULT OF ATTACK BY APHIS

A, ends of leaves shrivelled; B, buds fuzzy, scaly and dry

CHAPTER XV

Insects, Diseases and Other Pests

Happily the Carnation is not subject to quite so many insect pests as the Rose is, but it has its full share. The three most troublesome, undoubtedly, are aphis or plant louse, red spider and thrips. To a lesser extent the plants are attacked occasionally by the Rose beetle and Rose chafer, while the Carnation mite (*Perviculopsis graminum*) does harm to the flower buds by puncturing them, and also by carrying fungus spores. Damaged buds must be at once picked off and burned. Stigmanose, those yellow spots on the leaves, is really caused by the biting of thrips and greenfly (aphis), this latter being undoubtedly the most persistent and worst insect pest of any.

APHIS, RED SPIDER, THRIPS

Long before the grower can see these lice they may be at work well into the center of the growing point of the shoots, and it is only when the leaves begin to develop that the pitted appearance and the dried-up, sickened look of the points of the leaves shows the result of the previous draining of the juices by the hidden foe.

Examples of the kind of contorted growth we get when the plants are badly attacked by aphis are shown in the illustrations on pages 108 and 231. The flower buds in the latter example were a mere mass of dried looking scales that never would come to anything. To deal with aphis,

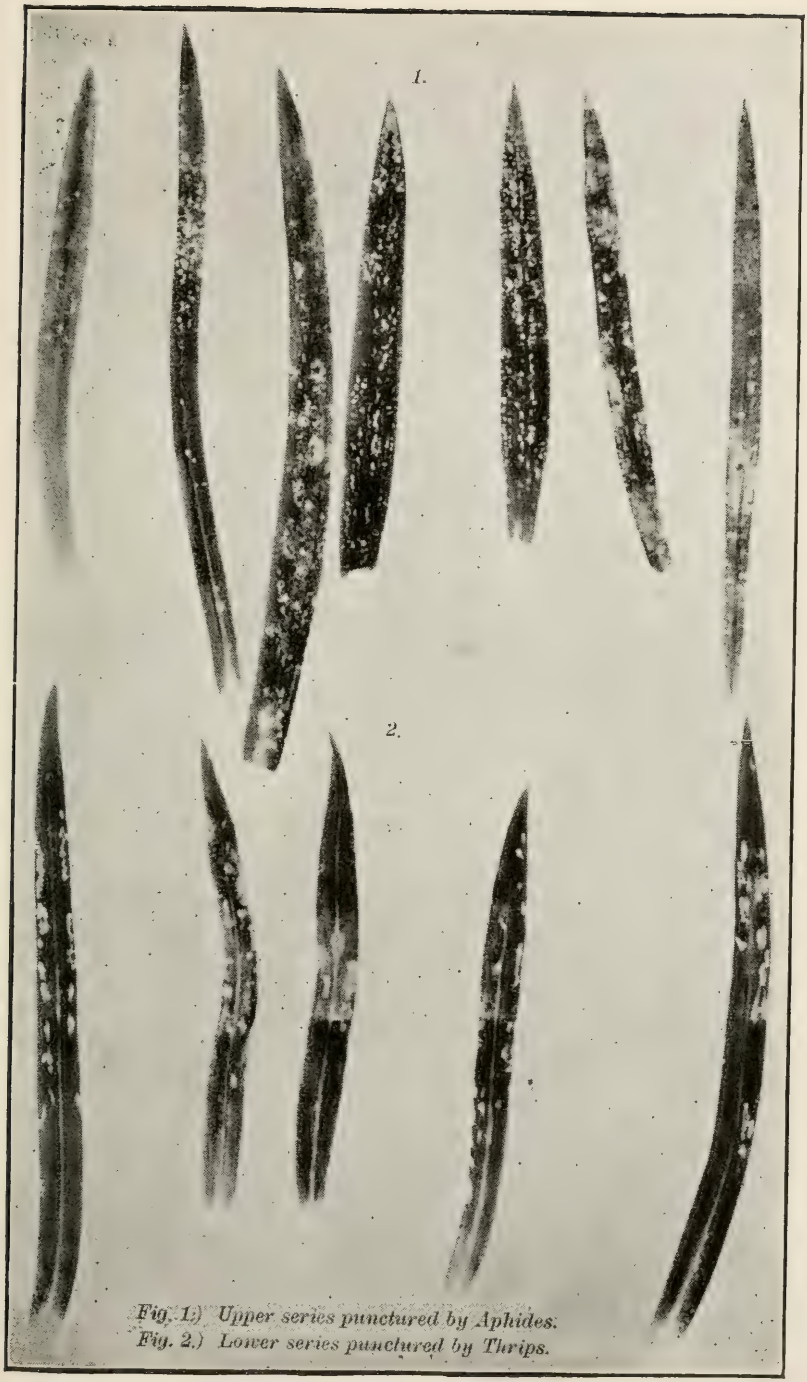


Fig. 1.) Upper series punctured by Aphides.
Fig. 2.) Lower series punctured by Thrips.

LEAVES DAMAGED BY APHIDES AND THRIPS

therefore, it is necessary to be constantly on the watch and to act on the adage, "Prevention is better than cure." Fumigate the house at intervals of a week or ten days with any of the well recognized nicotine fumigants that are on the market, or spray with any of the nicotine solutions several days in succession, then skip a day and continue again for two days and thereafter fumigate or syringe at regular intervals until every trace of them has vanished.

In the case of red spider, which gains headway sometimes in Winter when the houses have to be kept closed, with the heat up, spray the plants with a salt water solution, half an ounce of salt to a gallon of water; this to be done as often as necessary until the pest is got rid of, and thereafter once in three weeks. By means of forceful syringing through the hose the plants, as a rule, can be kept free of red spider. As an alternative to the salt spray, use a sulphur spray or dust the plants with sulphur; the salt, however, is preferable.

In the case of thrips, the same methods applied for the prevention or eradication of aphis holds good, or a sweetened poison spray consisting of two pounds of brown sugar to two tablespoonfuls of Paris green in three gallons of water may be tried. Another method is to use one ounce of whale oil soap in a gallon of water. Badly injured tops should be pinched out and destroyed.

The Rose beetle and chafer may be combated either by syringing or hand picking, or by spraying with arsenate of lead, which may be had in the form of a paste and can be used according to directions on the package. You cannot begin to have success until the plants are clean and healthy and kept so.

SNAILS

Snails are sometimes a pest to the Carnation grower and do harm, especially to the young plants. Regular light dustings with lime, and soot, each used separately are recommended, but these must be persistent until the snails have been cleared away. Or traps may be formed of slices of Potato laid about on the surface of the soil, these being gone over each morning and the snails thrown into hot water or otherwise destroyed.

BUDS ATTACKED BY CUT WORMS

The remedy for this pest is to visit the plants at night with a lantern and to remove the cut worms by hand, or, as an alternative, lay pieces of broken pots or similar material about at the base of the plants and uncover these the next morning; the cut worms congregate under these shelters. Thirdly, lay piles of sweetened bran about, these to be mixed with a little arsenic or Paris green, one part of the latter to six of the bran.

EFFECT OF GAS ON CARNATIONS

Cases are not infrequent in which gas from street mains through leak or other cause permeates the ground, and in Winter, when the surface of the street or uncovered land is frozen hard this gas finds an exit through heated greenhouses where the soil is not ice-bound and is, therefore, permeable. Much damage has been done from time to time. The first signs of poisoning by gas are when the plants begin to sicken, the flower goes to sleep, foliage turns yellow and the growth wilts. Leaks even forty feet away may give trouble in the manner described.

BUDS NOT OPENING

This trouble has been attributed to the use of too much nitrate which causes the buds to remain tight. It would seem as though over-development took place as a

N. J. Ex. Stat.

Dissection of two adventitious buds from the center of a "bull-headed" flower. The latter is a monstrous or abnormally large type of double bloom. In the center of these flowers occur the adventitious buds inside the whorls of petals. "This is a form of axillary prolification," and may be due to overfeeding or other irregularity

consequence of the over-fertilization, and the flower is thereby unable to expand thoroughly and naturally. It is suggested in such cases that the soil be dusted with lime and watered freely in order to carry away the fertilizer and cut away all these firm buds. The succeeding lot will come better.

SPLIT CALYX TROUBLE

There are many varieties more or less susceptible to splitting. In the case of Bonfire, Pink Delight, White Wonder, Gloriosa and St. Nicholas, the petals not be-

ing so numerous, grow straight up through the calyx without bursting it, while others, such as the Enchantress type, and Ward, are subject to splitting, and one has to be very careful in their growth. The increased amount of petalage causes the calyx to split, as the calyx has not always advanced with the flower, and the overabundance of petals contained in the small calyx causes the latter to split badly. The calyx is easily affected by thrips or conditions of temperature, and in this way receives a check which prevents its growing in proportion to the petals as they expand. While no one can absolutely prevent splits, nearly all the present day varieties can be grown in such a way as to reduce the trouble to a minimum by careful observation. Places that suffer most with the trouble are where the houses run north and south instead of east and west. In the former mentioned houses, during the short Winter days, the temperature rises rapidly until 11 A. M., then drops rapidly from that time until 2 P.M., the sun at noontime being in direct line with the ridge, and casting shadows over every plant in the house, after which time there is another rise until sunset, and if the man in charge is not familiar with these conditions he will have a fine crop of "splits."

Diseases *

"stem rot" (rhizoctonia sp.)

There are two recognized stem rots of the Carnation, one called the "dry stem rot," due to a species of Fusarium; the other, called the "wet stem rot," caused by the fungus Rhizoctonia. To more sharply distinguish these

*By George L. Peltier, Floricultural Pathologist, University of Illinois Agricultural Experiment Station, Urbana, Ill. (Reprinted from The Florists' Exchange, an. and Feb., 1914.)

two diseases it was suggested by us some time ago that the first be called " branch rot," for it rarely if at all attacks the stem of the Carnation plant, while the latter could be properly called " stem rot."

The stem rot which has caused the Carnation growers so much trouble, and which has so often been called the most serious disease of Carnations, is caused by a fungus called Rhizoctonia. This disease was first reported on Carnation and other plants about 1895. About 1900, several investigators published a number of papers on the rhizoctonial diseases of Potatoes, Beets and on a large number of other vegetables and field crops. Mention was also made of this disease on Carnation, Sweet William, China Aster and other floricultural crops, both in the field and greenhouse. Since this time little work has been done on the " stem rots " of floricultural plants caused by Rhizoctonia, although this disease has been causing considerable damage to a number of plants, especially the Carnation.

The symptoms of this disease are probably well known to most Carnation growers; the fungus usually attacks the plant at its crown, that is, where the stem enters the ground. It may enter at the surface of the ground, occasionally above, or below. From records kept the last two years it has been found that a plant with a single stem breaking about 2 in. from the ground is much more resistant to the fungus than a plant forking at or below the surface. It has also been observed that the former is generally attacked about an inch below the ground, while the latter forking just at or below the ground's surface, is not attacked by the fungus at the main stem. Usually one branch rots off first followed by the others in turn. At times several branches below ground like this may be

STEM-ROT DISEASE (RHIZOCTONIA SP.)

rotted off at the same time. Still another generalization can be made. The rotting of a plant with a single stem is always general, that is, the disease after it is established will extend from the roots to the branches, while in a diseased plant which is forked below ground the rot is always localized at the fork and seldom progresses into the main stem toward the roots. Therefore, it would be more advantageous to put in plants with a single stem which break at least 1 in. to 2 in. above the surface of the soil.

There is a well-known statement that setting the plants too deeply will cause them to be much more susceptible to stem rot. It does not make so much difference how deeply plants with a good, long, single stem are set, so long as they break above ground. However, if plants with a short stem, breaking low, are planted so that the fork is below ground, the fungus has a much better chance to attack the plants. The reason for this is obvious for they can be much more easily injured in cultivating, and the fungus does not encounter as thick a bark on the branches as on the main stem.

Usually the first indication of the disease is a paler green color of the entire plant or of a single branch. The plant does not wilt at once, for the lighter green color of the foliage may be noticed for a week or so before the actual wilting takes place. During cloudy weather the plant may not wilt for two weeks, and sometimes even longer, although the stem may be completely rotted. On sunny days the plants wilt much faster. During the course of our work on this disease, it appears that transpiration and temperature play a great part in the length of life of the plants after they are infected.

If the stem of a plant that shows the first sign of wilting is pressed just above the soil, a soft area is usually

felt and a slight twist is sufficient to slough off the bark, beneath which is usually a slimy, wet area which gives this rot its characteristic name. Often, however, the stem is dry at the point of attack and upon breaking off the stem the fibres seem to be separated giving a brush-like appearance to the broken stem in contrast to the firm stem of the branch rot.

There seems to be little or no damping off of the Carnation cuttings in the cutting bench, due to the fungus Rhizoctonia. In fact, we have never seen Rhizoctonia attack Carnation cuttings in the bench, although experiments have shown that the fungus will readily kill the cuttings. Stem rot, then, does not seem to be troublesome until the young plants are put into the field. During certain seasons little or no stem rot will be found, while at other times the whole field will be infected. This, of course, depends to a large extent on the weather conditions governing both the growth of the fungus and Carnation plants.

From observations in the Carnation field during the recent Summers, the following conclusions, some of which are doubtless well known, but which will bear repeating, have been reached:

(1) When plants are put out in the field in the Spring they are very liable to be set too deeply, which perhaps may bring about some morphological difference in the stem just at the surface of the ground, causing the plant to become more susceptible to stem rot. Great care should be exercised in planting the plants to the required depth. The same precautions should be taken when the plants are taken into the house in the Fall.

(2) From data collected from diseased plants in the field, it was noticed that a plant with a single stem which

breaks 1 in. to 2 in. above the surface of the soil is much less liable to stem rot than a plant breaking just at or slightly below the ground surface. The reason is again obvious. The branches of a plant forking at the surface of the ground are very easily broken off in different ways. They generally break at the base, making a wound, through which fungi can easily enter. The wound is later covered with soil, whereupon it is an easy matter for the fungus Rhizoctonia to enter the exposed tissue and produce stem rot. A large number of plants examined show that in the majority of cases the fungus gains entrance through a wound of this kind.

(3) Cultivating too deeply and throwing the soil up around the plants also produces a condition quite favorable to Rhizoctonia. Great care should be exercised not to injure any of the plants with the cultivator.

(4) If stem rot is present in a Carnation field all dead or wilted plants should be pulled up as soon as noticed and the soil surrounding the plants should be soaked with a fungicide, preferably formaldehyde. It can be applied in the dilution of 1:200. This fungicide is very desirable in this work as it will kill the mycelium of the fungus Rhizoctonia in the ground, and the fumes escaping from the soil quickly do not injure it in any way. Although it is somewhat expensive, it will give returns on the investment for a number of years, for if the fungus is killed the first year, the plants will be free from "stem rot" the second season.

The most critical point in the life of the Carnation plant is reached when it is transferred from the field to the house. The benching of the plant brings its vitality to the lowest point and makes it very susceptible to disease. The fungus may be brought in on the plant or may

be in the soil brought in from the field. Healthy plants put in infected soil will be killed in from two to four weeks, depending on temperature and light. Experiments show that the fungus will grow through the soil at the rate of one-half inch every 24 hours, which makes it simply a matter of a few days, comparatively speaking, until the neighboring plants, and finally the entire bench, has become infected.

As a rule most of the growers bench Carnation plants in August, when the temperature is still quite high. This condition in itself seems to be the most important factor in the spread and development of the disease, especially during the first month after the plants are transplanted. Again when the steam is turned on in the houses the number of stem rot plants will increase materially. During the Winter very little stem rot will develop if cultural conditions are good. However, when the temperature rises in the Spring and the steam is turned off, another point in the life of the plant is reached when it is very susceptible to disease. The low vitality of the plant at this period is responsible, in the main, for such a condition.

The successful passing over of the three most critical periods in the life of the plant in the house depends a great deal on the temperature. Of course, it is very hard to control the temperature at these points, but with careful attention to ventilation and cultural conditions, these periods may be tided over without serious injury.

One of the most important factors in the control of stem rot in the greenhouse is the careful selection of Carnation plants when brought in from the field. Any plant that shows the least signs of disease, as well as all unhealthy or damaged plants, should be discarded. The matter of selecting plants is, therefore, of prime importance, in fact

more important than the regulating of the temperature in the houses.

We come now to the question of: "*How does the fungus Rhizoctonia get into the house?*" Sometimes the plants in the field will show no signs of disease at all and still when the plants are brought into the house a large number will be lost. There is no question that the fungus Rhizoctonia is brought in with the soil and manure from the field or compost bed. Even so-called "virgin soil" will harbor the fungus. The fungus Rhizoctonia has a large range of hosts among field crops, vegetables, floricultural plants and weeds. Experiments have shown that the Rhizoctonia attacking one plant is the same form that attacks another.

The fungus Rhizoctonia has been found attacking weeds like the Thistle, Lamb's-quarters, Pigweed, Ragweed, yellow Mustard, Dock and many others which are generally found growing in fields and pastures. The same fungus also attacks Clover, which is usually sown in sod. It is clearly seen then that the soil used for compost is, as a rule, infected with the fungus Rhizoctonia, which causes the stem rot of Carnations. When the sod is composted with manure, the fungus is able to live for several years, so that it is still present when the soil is brought into the house.

The use of limestone in the compost will help materially in the suppression of the fungus, while if the Carnation field and houses become badly infected the grower must resort to sterilization of the soil. A number of experiments are in progress and the results to date tend to show that steam sterilization is the best means of killing the fungus in the soil that is brought into the house.

"BRANCH ROT" (DRY STEM ROT) (FUSARIUM SP.)

This disease was reported about the same time as the stem rot and has developed along with it, causing more or less confusion. Observations have shown that this disease is not as serious or infectious as the stem rot, although it is widely scattered and almost every grower has had more or less experience with it.

Branch rot is due to a species of Fusarium, which seems to work in the interior of the stem, and to cause the death of the larger branches and often the main stem. The stem and branches when attacked by this fungus gradually wilt and cause the leaves to turn a yellowish green. This yellowing or dying of the branch is rather rapid compared with stem rot. In the branch rot, the stem remains firm after death, although wilted and shriveled, and the bark does not slough off, while the tissue beneath remains firm.

The fungus may attack the plant at any time during its life. The method by which the fungus obtains entrance into the plant stem has not been entirely determined, but it doubtless gains entrance through a wound or by first establishing itself upon dead or inactive tissue and then penetrating the living tissue. The outer leaves of the cutting die soon after the cutting is put in and if these leaves are at all moist, they afford an excellent means of entrance for the fungus into the tender tissues. The plant itself may be injured in numerous ways, all of which afford an opportunity for the diseased organism to enter the plant. The fungus is not likely to cause injury to a sound plant through soil infection. However, it is undoubtedly truly parasitic at times.

One source of the disease is the cutting bench. It attacks cuttings very easily, and in this way the disease

is spread. The fungus easily attacks the cut surfaces causing them to lose their color and dry up, the cuttings finally yellowing and dying. The drying up of the leaves progresses downward until it reaches the stem. Here the fungus infects the stem and causes the rotting off of the cutting at the surface of the ground.

In many cases only the outer leaves are attacked, but sometimes the young leaves dry up and die. The fungus always produces a slimy, wet rot which is quite characteristic. Large areas 4 ft. and 5 ft. long in the bench have been seen in which all the cuttings have rotted off due to the fungus. To prevent the spread of the disease in this way, only cuttings from healthy plants should be used. The spores may lodge on the cuttings and when the young plants are transferred to pots the spores may germinate and find a wound to enter the tissues and so cause the dying of several branches or the whole plant. Again the same thing may hold true with the plants when they are set out in the field. The disease in the field is not of an infectious character, for diseased plants are often found isolated among healthy ones.

When the plants are benched in the Fall the fungus brought in from the field may cause some damage, for the plants seem to be more subject to infection in the houses than in the field. As its development is somewhat similar, the same precautions should be applied here as have been given for the stem rot.

CARNATION " YELLOWS "

" Yellows," as we shall call this disease for the present, to distinguish it from " Bacteriosis " and " Stigmanose," is widely distributed throughout the country, and seems to be increasing rapidly. The trouble starts in the young

leaves and is first noticed as small pale green areas varying in size and shape. On holding an infected leaf up to the light the dots appear translucent. These spots become more distinct and turn yellow, while the tissue beneath collapses. The trouble is confined not only to the leaves, but in badly infected plants, the branches and flower stems may be covered with the yellow elongated spots.

Apparently several distinct forms of yellows can be recognized, which differ in general appearance and subsequent behavior. The early stages of the first type consist of small translucent dots, scattered irregularly through the leaf. At first they are a paler green than the surrounding tissue, but distinctly delineated upon it. The spots increase more or less rapidly until they reach a diameter of 1 to 8 mm. Most of these spots are approximately circular, but may be irregular in outline, rarely elongated. Few of the spots coalesce in this form. This type is especially noticeable on the White Enchantress. A single leaf may have from one to two to fifty or more spots, depending on the extent of infection. Another characteristic of this first type is, that the spots do not tend to make the leaves brittle.

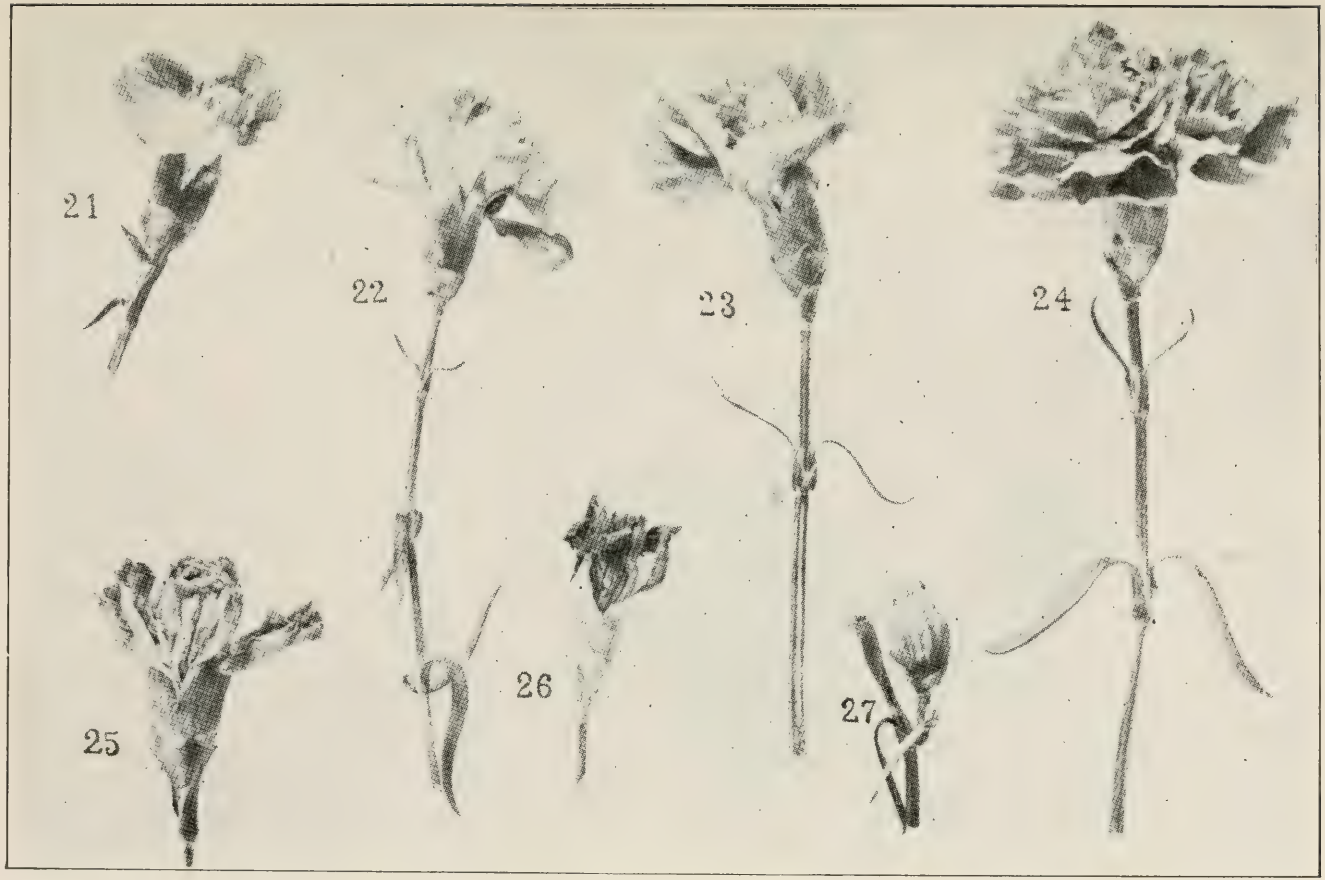
The development of the second form is similar to the one above, except that while still in the early stages the spots coalesce and become very much elongated, so that a single spot may be 1 in. to 2 in. or more in length. On badly infected leaves these elongated areas run parallel to the midrib and have a sort of flaky appearance. The leaves become very brittle and are easily snapped off. In the later stage the cells beneath the infected areas collapse, the spot becomes sunken and finally turns brown as the leaf dies. This type of yellows is found in the Beacon and Pink Enchantress and is as a rule much more destructive than the first type.

A third form may be mentioned here, which is found only on the red flowered varieties, as Beacon. Here the areas in the late stages take on a purplish color and are slightly raised. It is not known whether this form is the same as the others or not. The red flowered varieties are susceptible to both types.

As new shoots arise they become infected, while the old leaves at the base of the plant die off, giving the plant a very diseased appearance. While yellows does not kill the plants outright, it renders them useless, for they will produce only a few imperfect flowers, and in only slight attacks of yellows it retards the growth of the plant.

Microscopical observations show no rupture of the epidermis and with a lens the bloom on the leaf above the spots appears to be undisturbed. The chloroplasts are lighter in the diseased areas but do not seem degenerated. No bacteria or fungi are present except when the epidermis of the leaf is broken down. No insect punctures, as have been described by Woods, have been observed in the true yellows, in fact no collapsed tissue can be traced to the epidermis except in later stages, when the epidermis has been broken down.

No explanation as to the cause of this disease can be given at present. However, preliminary experiments have shown that the disease is probably not transmissible from one plant to another, but that it is carried from season to season by means of infected cuttings. Until the cause has been determined the suggestion is made that no cuttings from plants that show yellows be taken; and if any plants show these spots at any time from the cutting bench stage to the time they are brought into the house in the Fall they should be discarded. In this way the disease to a large extent will be eliminated.



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BUD ROT OF CARNATIONS, SHOWING HOW THE DISEASE AFFECTS THE FLOWERS

CARNATION BUD ROT (SPOROTRICHUM POAE)

The bud rot of Carnations is a disease that did not receive much attention prior to 1908. In this disease, some buds deviate only slightly from the normal, others fail to expand to perfect flowers, while some never open. In severe attacks the flowers wither and turn brown. The petals wither first, followed by the other parts. A soft rot develops in the buds, resulting in a discoloration of all the parts. In some cases, the fungus can be seen with the naked eye. There is commonly found associated with this fungus a mite which has no casual connection with the disease, but which may help in the distribution of the fungus. Here again control measures depend on ideal cultural conditions for the plants. Although bud rot may develop in sanitary houses, it is to be feared most where sanitary conditions do not prevail. The control and prevention depends then on the plants making a satisfactory growth under the best conditions possible. Affected buds should be gathered and burned. Susceptible varieties should not be grown where the disease prevails.

CARNATION FAIRY RING (HETEROSPORIUM ECHINULATUM) (BERK)

Occasionally this trouble is reported from various parts of the country. The disease is characterized by circular spots, varying in diameter bearing more or less concentric zones of a dark mold. The leaves, especially the younger ones, stems, and sometimes the calyx of the flower, may become affected. In some instances the whole top of the plant becomes moldy. Infected refuse and leaves should be burned. Spraying with Bordeaux mixture will also check the disease.

CARNATION "SPOT" (SEPTORIA DIANTHI) (DESM.)

Like rust this spot disease has been known a long time and is widely distributed. Inquiries show that at times it causes considerable damage. The "spot" is characterized by an oblong to circular brownish center, bordered by a purple band. The band is usually well defined near the center, but its outer edge diffuses with the green of the leaf. The whitish to brownish center is usually dotted with small minute black spots. These are parts of the fruiting bodies that produce the spores. The disease is particularly abundant upon the lower portion of the leaves and the internodes of the Carnation. The diseased leaves curl up or become distorted. This disease can be controlled by growing the plants under the best cultural conditions, paying especial attention to ventilation and watering.

CARNATION RUST (UROMYCES CARYOPHYLLINUS) (SCHRK.)

A number of years ago Carnation rust was one of the most serious diseases of Carnation plants. Today, although it is present to some extent, one need not be alarmed when it appears in the greenhouse. The decrease in virulence is due in part to the selection of resistant varieties. It was early seen in a study of this disease that some varieties were more susceptible under the same conditions than others. This gave some of the growers an excellent opportunity for the selection of resistant varieties, so that now we have plants that when grown under normal greenhouse conditions will be very resistant to rust. However, these same plants when grown under unfavorable conditions will be very susceptible to rust, so that in the control of rust, normal cultural conditions are necessary.

CARNATION ANTHRACNOSE (VOULUTELLA DIANTHI) (ATK.)

This disease is quite widely distributed, but does not seem to be as serious a pest as formerly. It attacks the lower leaves, especially those parts more or less in contact with a damp soil. The affected parts are pale and dotted with minute black areas which are the fruiting bodies. This disease is more severe in the cutting bench, injuring the cuttings so that they cannot be used. On the older plants if allowed to go unchecked the fungus will spread very rapidly, and so weaken the plant that the production of flowers will be materially checked. This disease can be checked by proper drainage and ventilation.

RECORD OF SUNSHINE

	Winter, 1904-5						Winter, 1905-6					
	Dec.		Jan.		Feb.		Dec.		Jan.		Feb.	
UNITED STATES	Hours.	Per Cent. of Possible.	Hours.	Per Cent. of Possible.	Hours.	Per Cent. of Possible.	Hours.	Per cent. of Possible.	Hours.	Per cent. of Possible.	Hours.	Per cent. of Possible.
Boston, Mass.	107	38	150	51	188	63	127	45	144	49	192	65
New York, N. Y.	119	41	159	53	182	61	153	53	150	50	216	72
Buffalo, N. Y.	50	18	78	27	164	56	79	28	93	34	185	63
Washington, D. C.	100	34	105	35	134	44	156	53	119	39	192	64
Toledo, Ohio	66	23	100	34	118	40	120	42	80	27	145	49
Cincinnati, Ohio	136	46	100	33	148	49	127	43	106	35	187	62
Chicago, Ill.	94	33	111	38	158	53	151	53	104	35	171	58
St. Louis, Mo.	141	48	143	47	160	53	175	60	138	45	180	60
Soult Ste. Marie, Mich.	58	22	84	30	156	54	41	15	61	22	142	49
St. Paul, Minn.	97	35	158	55	210	72	150	55	133	46	194	66
Omaha, Neb.	160	56	166	56	205	69	217	75	170	57	195	65
Helena, Mont.	110	42	104	37	206	71	121	45	134	48	166	58
Spokane, Wash.	40	15	54	20	137	48	52	20	56	20	114	40
Portland, Ore.	61	23	94	33	163	56	23	8	49	17	142	49
San Francisco, Cal.	137	46	133	44	192	64	144	49	140	46	79	26
CANADA												
Victoria, B. C.	28.1	11	69.1	25	135.2	47	38.5	15	38.3	14	171.1	41
Brandon, Man.	61.7	27	119.4	45	166.0	59	93.1	37	118.3	44	127.1	45
Winnipeg, Man.	55.9	22	140.4	53	156.7	55	86.7	34	91.2	34	149.0	53
Toronto, Ont.	68.5	25	83.8	28	116.7	40	67.7	24	88.0	29	138.7	47
Ottawa, Ont.	70.6	26	79.6	28	120.8	41	68.8	25	87.5	32	132.3	45
Montreal, Que.	67.2	29	79.1	33	110.5	44	42.3	20	59.8	25	105.6	43

Classification of Pink Carnations.—The definition of the varieties of Carnations according to their shades of pink or red as agreed upon by the American Carnation Society is as follows: 1, True flesh pink; 2, light pink, embracing the shades from Gloriosa to and including Winsor; 3, medium pink to embrace shades from Winsor down to and including Mrs. C. W. Ward; 4, dark pink—anything darker than Mrs. Ward.

Dyeing Carnations Green.—Green Carnations are still in demand to some extent for St. Patrick's Day, March 17. Popular opinion, however, would seem to be turning against them. For a dye, take ten cents' worth each of analine blue and analine yellow, and add two quarts of water, and bring to boiling point. This will make one gallon. Don't put the flower in until the liquid has cooled.

Grading Blooms.—In the New York market the Carnations are graded as Fancies, Extras and Firsts. The Fancies are all perfect blooms, 2¾ in. to 3½ in. across, with stems 16 in. to 24 in. long; the Extras are composed of flowers that are smaller, but still forming a distinct class apart from the Shorts, which form the third section.

Temperature of Icebox, and Time Carnations Will Keep.—The correct temperature for an icebox for keeping cut flowers is 40 to 50 deg. If the icebox has no provision for a change of air, Carnations will go to sleep sooner than in a box where there is such a provision. Furthermore, if the Carnations are placed on the floor of an unventilated box where injurious gases settle, and the air is consequently most contaminated, they will go to sleep sooner than when on the upper shelf. A clean, dry cellar, where the air is pure, and which has a temperature of about 50 deg., is a good place in which to keep Carnations. Fresh Carnations of the fancy and medium grades,

bought in the wholesale market, should keep four days in the icebox in the retail store. Fresh Carnations of good quality which have not been injured by either cold or heat ought not to go to sleep the first or second day in the icebox. It is, of course, a well-known fact that some varieties of Carnations tend to go to sleep early, and such varieties should be discarded.

Fumigating with Tobacco.—Those who employ the proprietory compounds, as advertised, will find directions on the packages, but questions are sometimes asked about the use of tobacco stems and tobacco dust. Not a few receptacles have been invented and are now on the market, some for holding the tobacco stems while they are burning, and some for holding the powder or dust. Greenhouses are fumigated best at night, not when the full sunshine is on the plants. The tobacco stems are usually moistened with water that they may not burn too fast, and are placed either in the receptacles above spoken of, or directly on the soil or the concrete of the greenhouse paths, at different points along the paths. The stems or powder are then ignited and the greenhouses are closed as tightly as possible. The smoke from the stems or powder can be left in through the night, or the doors and ventilators can be opened a little to allow it to escape after two or three hours. The rule is to use enough of the stems or powder so as to produce a moderately thick smoke. It is much better to fumigate greenhouses moderately and often than to make very heavy fumigations at any one time, since the latter is liable to injure the plants.

Liquid Manure for Carnations.—Dustings of lime, wood ashes or various chemical fertilizers may be given as elsewhere explained; but for a liquid application use cow

manure, a bushel measure to 100 gallons of water. Soot in a bag, 1 peck to 30 gallons of water, furnishes a clear, liquid fertilizer.

Potash for Weak-stemmed Carnations.—Weak-stemmed Carnations are benefited by a light dressing of sulphate of potash, ½ oz. per sq. yd., or wood ashes from hard wood which contain potash. Potash has the characteristic of adding stability and strength to stems and giving generally a tone and color to the foliage.

Phosphoric Acid can be used at the rate of ½ oz. to the gallon of water with good results. Like potash, but in another way, it stiffens growth and inclines the plant to produce flowers and seeds, should seeds be developing. Iron, in the form of sulphate of iron, has an influence for good on the color of the foliage, and lime, given as a light dressing of slaked lime, produces the effect of sweetening the soil, and is utilized to some extent directly by the roots.

Hen Manure for Carnations.—Poultry manures contain a fair percentage of nitrogen, phosphate and potash. One peck of hen manure to about five gallons of water is the proper proportion to use as a liquid fertilizer. Allow this to stand for about a week, after which it will be fermented. Use this liquid alternatively with a mulch of cow manure.

Nitrate of Soda.—Use one ounce to four gallons of water about once every two weeks when the plants are well into bloom and require support to continue flowering.

Directions for Taking Notes on Carnations.—Purchasers of novelties ask themselves the following questions, among others, in regard to the variety: 1,

Does the plant make a large or small amount of grass (foliage)? 2, Does it produce many cuttings on blossom stems, or must stock plants (not allowed to bloom) be grown to obtain cuttings? 3, Does it propagate easily? 4, Are better results obtained from field-grown plants or from those set out directly from the pots on the greenhouse benches? 5, Is it an early bloomer? 6, Size of flower? How built? Fringed or toothed petals? 7, Color? Fragrance? 8, Length of stem? 9, Bursting of calyx? 10, Keeping quality of flowers? 11, General remarks on appearance and health. 12, Photographs to show half open bud and calyx, and fully opened blooms, and if feasible, an entire plant in bloom to show its general habit.

Synonymy.—The following types or sections of the Carnation are all referable, in their origin, to Dianthus Caryophyllus:—Clove Gillyflower, Clove Pink, Picotee, Flaked, Self, Bizarre, Fancy, Border, Malmaison, Marguerite, Grenadin, Superflorens, Everblooming, Tree, Remontant, Forcing Pink, Hybrid Perpetual Pink, Perpetual-flowering and Winter-flowering. The Pinks are variously described as Common Garden, Scotch, Hardy, Bunch, Grass, Cushion, Florists,' or Pheasant's-eye, but all so-called are referable to the species D. plumarius. Sometimes the Sweet William is also called Bunch Pink. The annual China Pink (Dianthus Chinensis) is variously called Japan Pink, Indian Pink, Annual Pink, diadematus, laciniatus, or Heddewigii and stellaris, the last four names referring to well marked varieties.

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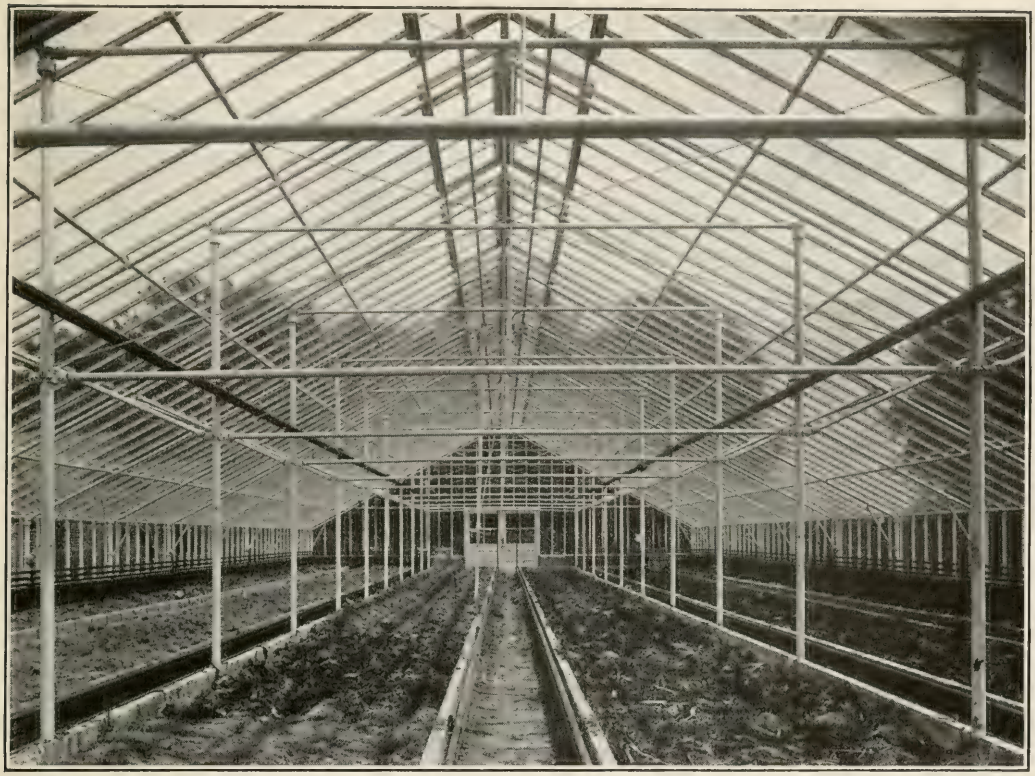

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