CIRCULAR OF INFORMATION NO. 32.

UNIVERSITY OF MISSOURI.

COLLEGE OF AGRICULTURE AND
MECHANIC ARTS.

AGRICULTURAL EXPERIMENT STATION,
COLUMBIA, MO.

Missouri Apple Growing.

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Reprint from the Annual Report of the Missouri State Board
of Horticulture, 1908.

THE HUGH STEPHENS PRINTING COMPANY,
JEFFERSON CITY, MO.

MISSOURI APPLE GROWING.

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Soil and Location—Generally speaking, apples trees thrive best upon light, well drained land. A gravelly sub-soil is preferable to stiff clay. In fact, the subsoil is of more importance than the surface soil itself. Hilly, broken places are usually better than level, flat areas. Many rugged hillsides along our rivers too steep for ordinary tillage are excellent for apple orchards. The deep, loamy "loess" soil along our great rivers and some of our tributaries, and the red soils of the broken Ozark region are among the very best apple soils. While some soils are better than others, almost any farm in the State is capable of producing a good family orchard, that will many times repay for the trouble and expense of growing it. Good drainage, to allow the roots to penetrate, is more essential than richness of soil, so the less tillable places on the farm may be selected for the orchard.

Where there is opportunity for a choice of slope the local conditions and varieties to be planted govern somewhat the site that should be selected. Often a northern or eastern slope is to be preferred. On rocky, thin soils the northern slopes are usually richer and they stand the drought better than the southern slope. The buds start later on a northern slope, and are more liable to escape late spring frosts. Other things being equal, the fruit is usually higher colored and it seems to be better flavored on the southern slope. If proper attention is given to the selection of varieties; apples may be grown successfully if soil conditions are right. Low, damp places should be avoided.

The character of the native forest trees indicate to some extent the fitness of the land for apple trees. Where the nut trees, sugar maple, poplar, papaw, linn or sumac thrive apples usually do well. The larger and finer the growth of these native trees, the stronger the indication that an orchard will thrive there.

Varieties.—Among the leading varieties in the commercial orchards of the State are: Ben Davis, Gano, Jonathan, York, Missouri Pippin, Winesap, Grimes, Ingram, Delicious and Rome Beauty. The leading commercial varieties of summer apples are Maiden's Blush and Wealthy. Other sorts like Genet, Paynes Keeper, Huntsman and Mammoth Black Twig are sometimes propagated. Ben Davis and Gano, two varieties that are very much alike, are the leading commercial sorts. These two varieties are more largely grown in Missouri that all other sorts combined. In most localities experienced growers recommend planting at least half their orchard to these varieties. The trees bear heavily and the fruit ships better than almost any other sort, and they are among the best cooking apples. Their quality, however, is not the best. They are remarkably cosmopolitan, succeeding well in all parts of the State.

Next to these two sorts the Jonathan is perhaps the most popular general commercial variety. It is of the richest red color and the highest flavor. It is productive throughout the State. The Jonathan ripens earlier than the Ben Davis or Gano, and is not so good a keeper. In cold storage, however, it will keep perfectly until late winter or early spring, and as a dessert fruit it is one of the best of the State.

The York is unexcelled in size, quality and appearance as a commercial variety. In some parts of the State it produces well. It is a splendid keeper, and gaining in popularity, particularly in certain sections of Missouri. It is one of the most profitable varieties to grow on the "loess" formation along the Missouri river hills. It has the fault of scalding somewhat if kept either too cold or too hot in storage.

Grimes is unexcelled in quality, and has a rich yellow color; it is neither a strong grower nor a heavy bearer, except in certain localities. It is one of the finest dessert fruits, brings the highest price on the markets, and where it thrives well, is very profitable. It requires a rich soil.

The Missouri Pippin is planted commercially to some extent. It is good color, but not the best in quality. It is one of the earliest to come into bearing and, perhaps, on this account, and a tendency to overbear, the fruit tends to be of small size after the first few crops. A small portion of this sort will be profitable in some localities.

The Winesap is of good color and of good flavor, as well as one of the best keepers. In some localities it is undersized and not

of sufficient vigor and productiveness. Generally speaking, it ranks as one of the commercial varieties in this State. It blossoms somewhat late and usually escapes spring frosts.

Ingram is one of the best keepers, and of fair quality. Generally speaking, it is more profitable in the southern part of the State than in the northern. In one section of Southwest Missouri it is one of the most profitable varieties. It is particularly adapted to soils that are too low and cold for the best development of other sorts. It blossoms very late in spring, and is quite safe from spring frosts.

It is well to bear in mind that some of the above varieties are cosmopolitan in their adaptability to conditions, while others are to be especially commended only for certain soils and localities. Ben Davis, Gano and Jonathan are generally well adapted to all soils slopes and localities in the State. Winesap, Mammoth Black Twig, York and Rome Beauty succeed well on southern slopes and on thin land. Genet, Ingram and Rome Beauty are among the best to select for moderately low land. They blossom late and are seldom killed by late frosts.

When selecting varieties for a commercial orchard it is of the highest importance that we study the varieties already growing in the locality, especially in similar soils, and where the altitude and other conditions are the same. More information may be gained in this way than by any printed list. A commercial orchard should contain from three to six leading sorts, and these may be generally selected from the varieties discussed above.

For a home orchard the main planting should be of the commercial varieties just mentioned, considering that they are usually good keepers, and will supply the family needs throughout the winter. In addition, a few trees each of some earlier sorts should be included, to give a succession of fruit from early summer until late ones are ripe. Such varieties as Yellow Transparent, Early Harvest, Red Astrachan, Sweet June, Red June, Rambo, Benoni, Maiden's Blush and Chenango Strawberry, make a good general list.

It is of less importance to give directions for selecting an orchard for home use than it is for market, because in the former case the grower should suit the taste of himself and family, and those varieties should be grown, while in the latter case the most profitable sorts for commercial purposes are restricted to a few varieties.

Previous Preparation of Land.—Where new woodlands are to be cleared and planted it is best to clear the land and plant the apple trees the following spring. The clearing may be begun any time after August first. It is best to cut the stumps as low as possible, none being left higher than one-half their diameter. This allows working the ground well, as the implements will pass over the low stumps, where they would catch on the higher ones.

After the land is cleared it may be plowed at any time that it is workable,, before the time comes for setting the trees in early spring. Where the nature of the soil will permit, the turning plow should be used, plowing as close to the stumps as possible. A heavy A harrow, with teeth long and heavy enough to slide over the low stumps, is usually employed for fining the land after plowing. Where the land is too rough or stony to use a turning plow, a "Single-Shovel" or "Bull-Tongue," with standing coulter to cut the roots, is often used.

Old farm land that has been long in cultivation should be plowed as deeply as practicable and harrowed well. If the land lacks humus or is subject to washing, a crop of cowpeas or clover should be grown and plowed under before planting the orchard.

Many rugged hillsides that are too stony to plow or cultivate, may be profitably planted to apples. A small circle can be cultivated around each tree with a hoe, pick or grubbing hoe, and the rest of the ground seeded to clover, or eventually allowed to grow up to bluegrass. The growth between the trees should be frequently mowed down the first few years, until the trees are well established, then it may be either mowed, or in some cases, pastured. Where orchards are allowed to stand in sod, enough of the grass or clover should be left on the ground to make a good mulch. It should never be pastured too closely. Trees managed in this way on steep, rocky places, often do as well as cultivated trees do on larger areas. They have perfect drainage, and their roots anchor themselves deep among the rocks, so that cultivation is less essential than it is in some other soils.

After land is properly plowed and harrowed, the tree rows are usually marked out with a team and marker of some kind. A single shovel or other tool may be used. On small areas a chain may be dragged by a man to mark it. In large areas dead furrows are sometimes opened in check rows across the ground, which assists materially in digging the holes for the trees. Wher-

ever a tree is to stand, four furrows have been turned out, thus nearly digging the hole for the trees.

There is no stated distance apart which trees should be planted. Perhaps the most common distance is to plant the trees twenty-five feet apart in check rows. At this distance it requires about seventy trees to plant an acre. This, in the writer's judgment, is the best distance to recommend. Some plant thirty feet apart, and then plant a tree of such variety as Missouri Pippin between these running north and south. This makes the trees fifteen feet apart one way and thirty feet apart the other. When the permanent trees need the room the temporary ones should be cut out. Planting temporary trees, or fillers, is not generally to be recommended, however. The grower usually allows them to stand too long, not having the courage to cut out young trees in their prime.

Selecting Trees.—Two-year-old apple trees are usually best for planting. Correspondence with the leading orchardists shows that more than three-fourths of them prefer two-year-old trees. In the Station grounds, where we have planted trees of various ages for a good many years, the two-year-olds have universally given the best results, considering the expense of handling, the subsequent care they need, etc. A few growers prefer large one-year-old trees, but they generally admit that these require more careful cultivation for the first year or two to get them established. Occasionally a grower prefers three-year-old trees. If carefully taken up with a good root-system and planted nearby, so that they are not handled much, three-year-old trees may be transplanted so that they will do well. If dug with an ordinary nursery tree digger, so that the root system is cut quite short, and are packed and shipped, three-year-old trees are liable to give unsatisfactory results.

Other things being equal, it is best to secure trees from your home nurserymen. They generally know what varieties will succeed best in your neighborhood, and can give many special cultural directions and other valuable advice. The nurseryman should be a kind of horticultural educator in his community. In selecting home-grown trees, one is not liable to introduce insects or diseases which are not already in the neighborhood. Again, one can have the opportunity and advantage of visiting the nursery and selecting the trees he wants. One should plant straight, symmetrical and vigorous trees, but not necessarily the largest ones. Avoid badly forked trees, or those that are headed at the wrong height.

Planting.—In planting, the holes should be dug deep enough and broad enough to accommodate the natural spread of the roots. We often hear it recommended to dig very large, deep holes, to fill them with miscellaneous material and then plant the trees. If the trees are to be planted on the lawn, where the grass grows, it is perhaps well to dig a large hole in order to kill the grass roots for a considerable space about the trees. In planting in the commercial orchard, however, where the soil is to be tilled, the general plowing and tillage fits the entire land for the best growth of the tree, so that especially large holes are not necessary. When the tree is to be set, it should be held in the hole so its largest branches are extended towards the south or southwest, in order to shade the trunk from the sun. It should be set as deeply as it stood in the nursery, and should stand straight. It should also be in line with the other trees in the row, so the row will be straight. The trees should be set firmly and no air spaces should be left about the roots. To accomplish this the shovel should be shaken in throwing in the earth, so as to scatter it among the roots instead of putting it into the hole in compact masses. The tree should also be shaken up and down until the earth begins to cover well the roots, in order that the soil may be worked well into all the crevices. As soon as the earth is put into the hole, tramp it firmly with the foot, so that it will be left firm from the bottom up. If one tries filing the hole and then tramping, the earth will not be firm at the bottom and the roots will dry out. An inch of loose soil should be spread about the tree to prevent baking of the soil.

It is usually best to set trees in early spring, but if the land is moist and other conditions favorable, they may be set in autumn. If the soil and atmospheric conditions are favorable, autumn planting has the advantage of getting the work out of the way instead of delaying it until the more busy months of spring. If the autumn is very dry, however, it is usually advisable to delay planting until spring, as transplanted trees under these circumstances are liable to dry out and suffer during winter.

Pruning.—At the time of planting, the root-system of young trees should be pruned just enough to remove any mangled or broken roots; to make a smooth, instead of a ragged wound, and to shorten long or straggling roots to six or eight inches in length. It is better to cut off part of a long root than to double it up in the hole at the time of planting. It has been advised in pruning large roots, to hold the tree in the hand with the top downward, so that the wound will be made on the lower surface of the root.

Experiments, however, have shown no advantage in this method over that of cutting from the top downward, so that the wound occurs on the upper surface of the root. The essential point is, that the soil should come in close contact with the wound, in which case the wound callouses, and emits new roots, regardless of the position of the wound; the side branches or limbs above ground should be shortened somewhat to balance the reduced root-system, but a straight central trunk or leader should be maintained. If a tree is forked, one side of the fork should be cut to a few inches in length. If limbs occur below the head (place where the tree should branch), they should be cut off as close to the trunk as possible, unless they are so large that the cut will make a dangerous wound, when they should be shortened to a few inches in length to prevent their making much growth, and the stubs remaining should be removed entirely the next season.

One-year-old trees that have not branched after transplanting, will throw out a few branches near their tops, thus forming heads at that height. To prevent their heading too high, they may be cut off about six or eight inches above the height at which it is decided to have the head form.

As a rule, low heads are preferred in this section. Some extensive apple growers prefer to head their trees as low as one foot from the ground, while others still advocate the old method of heading them high enough so that a team can walk under the branches. The majority prefer to head their trees about two feet above the ground. The tendency is toward lower rather than higher heads, formerly recommended.

The subsequent annual pruning of apple trees is a matter of considerable importance. Most of the pruning is usually done during the winter. The fruit grower usually has more time at command in winter than in summer. Judicious pruning may be done at almost any season, however, except, perhaps, during the short period when the trees would bleed, in spring, and it is highly desirable to remove dead, broken, injured or diseased parts whenever they occur.

Those in this State who prune, usually prune too much rather than too little. Others make an equally serious mistake of pruning none at all. While some pruning should be done annually, the aim in this climate should be to make strong, compact, dense heads, rather than open ones. More pruning should be done during the first few years while the trees are being shaped than later.

One of the first considerations is to aim to maintain a straight

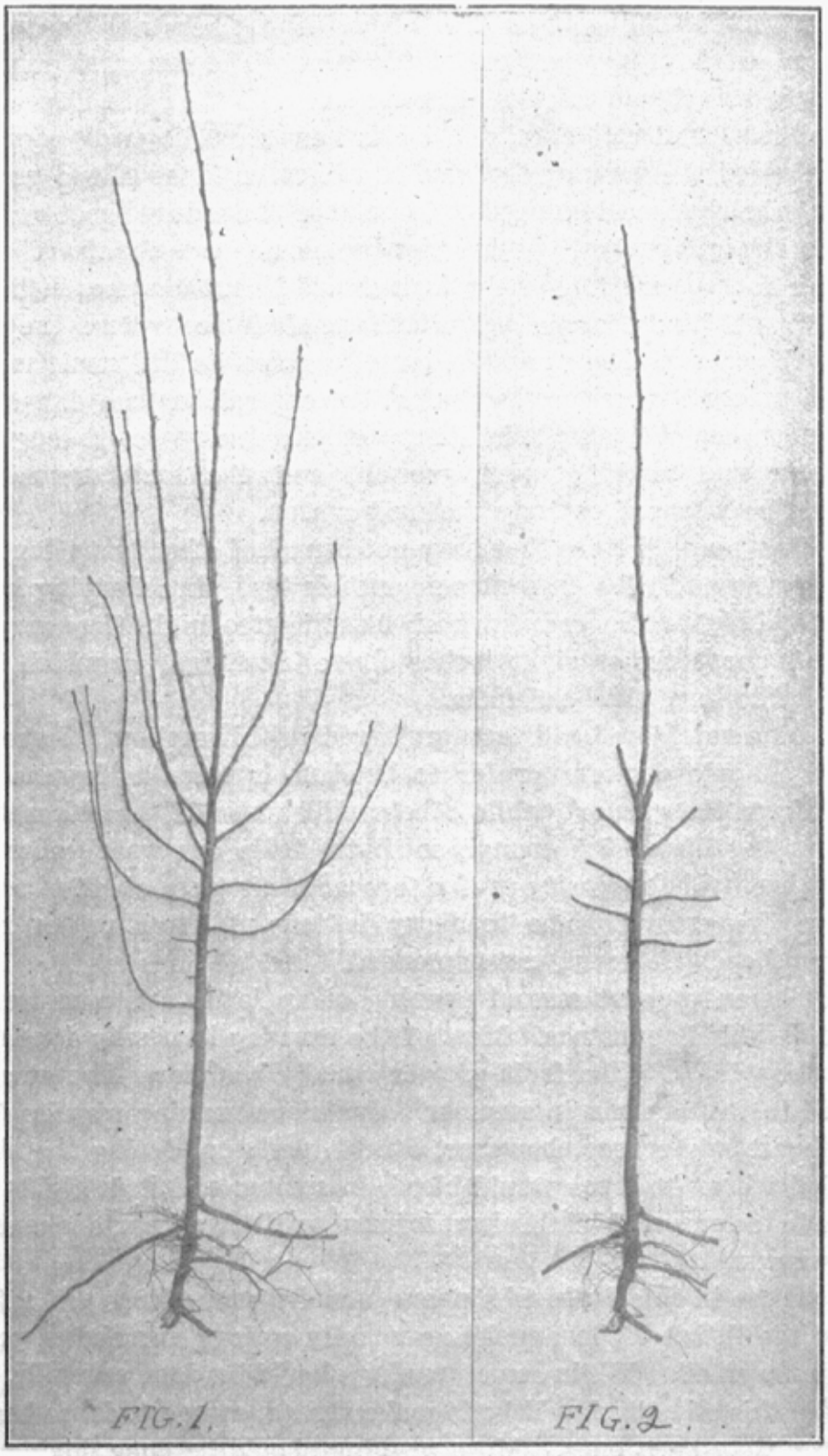

Figure 1. Typical two-year-old apple tree before pruning to plant.
Figure 2. Same as Fig. 1, but pruned ready for planting.

central trunk or leader, if possible. A branch near the center of the tree should be selected for the leader and kept in the ascendency by pruning all other branches that tend to outgrow it. If forks occur in this leader, one side of the fork should be severely cut back in order that the other side may be retained as the leader. Trees growing in this way are not likely to split down when heavily loaded with fruit.

The symmetry of the tree should be maintained by cutting back any branches that grow too far to one side. If branches grow to each other, and rub severely enough to cause injury, one should be cut out to avoid interference. If branches are numerous enough to crowd each other severely some may be removed. There is more danger of opening up holes in the head of the trees and letting in too much sunlight to scorch the trunk and main limbs than there is of leaving the branches too thick. Where the upright growing limbs of young trees appear to be very dense they will usually be weighted down by the first heavy crop of fruit sufficiently to open up the head of the tree. Whenever there is doubt as to whether a branch should be removed, it is perhaps safer to leave than to remove it. Water sprouts, which are the bane of some fruit growers' existence, will not usually form in trees if the tree head is maintained in this way. Water sprouts are oftener an indication of too much pruning than too little.

It may be observed in almost any orchard in this section of the country, that the branches on the north side of the trees tend to outgrow those on the south side. The influence of the sun and hot winds from the south and southwest seem to be too strong for the best development of the branches. The trunk and main limbs often suffer from these causes. This uneven growth in the sides of the tree is more marked in some varieties than in others, but is more or less observable in all. It will be understood from this, that the pruning may be more severe on the north side than on the south side of the trees. It is frequently advisable to shorten the northern branches somewhat. In removing surplus branches, it is often safe to cut one from the north side, when a similar branch should not be removed from the south side. Particular care should be taken to encourage the maximum growth of southern branches, while the northern may be cut more severely without damage. In this connection some growers advocate setting a tree so that it will lean toward the southwest. This plan is finding few advocates during recent years, as the branches of the tree grow in the same direction, even though the trunk leans, and this

results in an upright head on an inclined trunk, which is undesirable.

The above caution against thinning the limbs too much should not be construed to mean that apple trees should not be pruned. The orchard should be gone over each year and all trees pruned that require it. A surplus branch should be removed while it is young, so that the wounds will be as small as possible. A little pruning each year is better than to allow the trees to go without pruning for several seasons, and then remove a great deal of wood all at once. If a neglected orchard is to be pruned, the surplus branches should not be removed all at one time, as this may let in too much sunlight on the limbs or trunks that are accustomed to shade.

Cultivation.—Apple trees should be given clean culture, the same as corn or other hoed crops. It is well to begin cultivation early in the spring to air out the ground, stimulate early root growth and let the spring rains down into the subsoil, where the water may be stored for use during the hot, dry months of summer. It is a mistake to allow the land to lie hard and crusty in spring simply because weeds are not growing, and in this way allow the washing off of the rains over the surface when they should be stored in the subsoil below. In most cases the soil may be turned with a plow, but in some cases it is desirable to use a cutaway harrow, disc or other tool. The latter cultivation should be shallow, so as not to dry out the soil too deep during summer. A crust should not be allowed to form on the ground, but a loose dust mulch maintained on the surface. This is the best kind of surface mulch to retain the moisture in the soil. Cultivation should cease early enough for the wood to ripen for winter. The exact time varies according to conditions. If the trees are carrying a heavy crop of fruit, or if the autumn is dry, the ground should be kept in good tilth until September. If the season is favorable for the late growth of the trees, cultivation may cease in July. Sometimes a drought in July or August will cause uncultivated trees to shed their leaves and almost become dormant in late summer, and then burst into almost spring-like growth when autumn rains come. This autumn growth should be avoided by giving the best cultivation during any mid-summer drought that may occur so that the trees will not cease growth until the normal time in autumn.

While clean culture during a part of the season is highly desirable, it is not advisable to allow the orchard to go very many

years without plowing in some kind of plant growth to prevent the land from losing humus. In young orchards it is also often desirable to grow some kind of crop between the trees to help pay for their cultivation until they come into bearing.

Crops of almost any kind that can be cultivated, may be grown between the trees. Corn is a good crop for large orchards on rich soil, for the corn can be managed in large areas. Small fruits or garden vegetables are suitable for small orchards. One should never sow grain or a crop that cannot be cultivated for at least part of the season in the orchard. Cowpeas is one of the best orchard crops for this State, especially on thin soils. If they are sown in drills and cultivated for a time, it is better for the trees, but cowpeas sown broadcast in June, after the orchard has been well cultivated in spring, are better than most other crops, even though the other crops are given continuous culture. Cowpeas or soy beans are an excellent crop to plant in drills next to the trees when the corn is planted in the middle between the rows. Two rows of peas next to the trees and four rows of corn in the center make a good planting. If fed to hogs, this affords a mixed ration which is said to be superior to one kind of feed alone.

Diseases.—It may be briefly stated that apple trees should be sprayed with the Bordeaux mixture just before the buds burst in spring; just before the flowers open; as soon as the blossoms are gone; and twice at intervals of ten to fourteen days subsequently. This will do away with most of the scab and skin blotch and other fungous diseases. The Bordeaux mixture is made by combining four pounds of lime and four pounds of copper sulphate with fifty gallons of water. The lime should be slacked and mixed with 25 gallons of water. The copper sulphate should be dissolved by suspending it in a sack so it will just touch water in a tub. The four pounds of copper sulphate should be mixed with 25 gallons of water and then poured into 25 gallons of lime water. This mixture should be strained through excelsior, clean straw, or other strainer, so it will not clog the nozzle, and it will then be ready for use.

To simplify the work, copper sulphate may be dissolved (say one pound to each gallon of water), and four gallons of this solution may be used for each 50 gallons of the Bordeaux mixture. The lime also may be slacked in large quantities and the equivalent of four pounds of dry lime used for each 50 gallons. The lime water and copper sulphate solution should not be put together until they are to be used. It should also be remembered that they should not be mixed too strong, but that half of the water should be

added to each before mixing. For canker worm, codling moth, and other biting insects, five ounces of Paris green or London purple, or some equivalent arsenical poison may be added to each 50 gallons of Bordeaux mixture at the time these insects appear. For borers the trunks of the trees may be wrapped with papers, cornstalks, mosquito netting, or wooden veneer wrapper. These wrappers also keep off rabbits, and protect the trunks of the trees from sunscald. It is fair to state that some growers have reported injurious results from the use of wooden wrappers. We have used them for years on some of the trees of the Station orchard, and have seen them used in many of the largest orchards in the State, and have observed no injurious effects from their use where they have been kept loose on the trees so as not to allow them to prevent proper growth.

Picking and Packing.—The time to pick apples depends upon the variety and the character of the season. Apples which are picked early usually keep better than those which are picked late. Early picked fruit has a tendency to shrivel and become tough from loss of moisture. It also lacks color.

If allowed to remain on the trees longer, the apples take on a better color, but are more liable to rot in storage. It should be borne in mind, however, that if apples are picked moderately early, they will continue to color up after being gathered. It is usually best to pick them as early as possible without their being liable to shrivel after the picking, even though their best color has not been reached. For general storage the mistake of picking too late more frequently occurs than that of picking too early. If apples are to be stored in an ordinary cellar, they should be picked earlier than if they are to be put in cold storage, for the reason that in the cellar the breaking-down process of the fruit goes on much more rapidly during winter than it does in the low temperature of cold storage buildings.

Certain varieties should be picked earlier than others. Generally speaking, those which ripen earliest should be gathered first, and the latest keepers should be the last to be taken from the trees. The Jonathan, for instance, usually should be picked a month earlier than the Ben Davis. The Jonathan and York should be picked before they have reached their full color, which is usually some time in September. Grimes Golden should be picked when the earliest specimens begin to assume a yellow color and when their seeds begin to turn black. Ben Davis and Gano are usually gathered in October, when they have taken on good color, and the later

keepers, like Ingram, Genet, Winesap and Clayton, may be allowed to remain on the trees even a little later.

In gathering apples they should be handled so as to receive as few bruises as possible. They should never be shaken or knocked from the trees, but picked singly in the hand, placed in a one-half bushel basket, well padded with burlap, and handled as little as possible before they are finally put into barrels or boxes. Every apple should be picked with the stem on. It is as much a part of the apple as the skin itself. Pulling out the stem leaves a wound in the cavity of the apple, where bacteria and germs of decay find a convenient breeding place. Not only should all bruises of the skin be avoided, but the natural waxy color of the apple should, so far as possible, be retained intact.

A cool place in an open shed or the shade of trees should be selected for packing. Apples should be cooled as much as possible before they are put in the barrels. If barreled up and put in storage hot they are very liable to decay badly before the mass becomes cool through.

In barreling, two layers of apples should be placed with stems toward the head in the bottom of the barrel, the last apple in each layer being of such size as to wedge the layer tight. Other apples may then be carefully put in. The apples should be frequently shaken down into place by lifting the barrel up and down and shaking it sideways, so that during the filling process the fruit will be packed as tight as possible. When the barrel is nearly full, two more layers of headers should be placed in so the last layer will stand about one inch above the chine of the barrel. The clamp should then be adjusted and the head pressed down into place to retain the fruit tight in the barrel. If fruit is loosely packed so that it will move about during shipment or handling, the apples become bruised and rot badly. After filling, the barrels should be placed where they will cool off as quickly and thoroughly as possible, and never be piled in large masses during hot days.

Ordinarily two or three grades of apples are made. In some cases the very finest specimens are selected, double wrapped in tissue paper and packed in bushel boxes or barrels to catch the highest prices in the market. In places where Jonathan, Grimes Golden and York are grown, it is highly desirable to pack the select portion of the product into boxes and put in cold storage and sell for high prices in late winter or early spring.

The majority of apples, however, should be sorted into first

and second grades and barreled. Those which are not suitable for packing may go into the evaporator.

In barreling apples the packing should be uniform throughout. It is a mistake to put fine fruit in the ends of the barrel and fill up the center with culls. Only sound specimens should be barreled, one soft or rotten fruit often being capable of causing nearly the entire barrel to decay.