METHODS OF MARKETING

MISSOURI APPLES.

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by

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METHODS OF MARKETING MISSOURI APPLES.

Introduction.

Missouri is the leading state in number of apple trees, yet it ranks fourth in yield and in total value.¹ In comparison with other states, Missouri is twenty-eighth in bushels and thirty-seventh in value per tree. This condition shows that there is something wrong with Missouri methods. A study of the methods employed in this state, and a general survey of other states that are higher in productive value, shows there are two main reasons for this condition. The lack of proper production, in general, will apply to every fruit center of the state, but not to every orchard in these sections. The second but most important point, and one that will apply to more growers than the first, is lack of understanding of the vital question of marketing. At this point in production the average Missouri grower stops. He is prone to try to sell his unstandardized fruit on the tree or on the packing table. It is useless to say that such transactions will mean a great sacrifice on his part be-

¹ U. S. Census, 1910.

cause the buyer who purchases the apples on the tree will necessarily have to buy them at a lower cost than he would if they were properly produced. The quality of well grown Missouri fruit is equal to that produced in other sections, and it excels in quality fruit produced in irrigated regions.

The enormous annual waste of apples in the fruit producing centers of the state and the large percentage of fruit on the Missouri markets, produced in other sections, are the two principal conditions that prompted the writer to make this investigation. It has been his pleasure to make personal visits to the fruit producing centers of the state at harvesting time, and to study the conditions as they exist. There is an inestimable amount of fruit that goes to waste in all sections. Much of this fruit would be of extra fancy grade, if properly prepared for the market. It is the prevailing opinion among growers that the markets are glutted during the shipping season. They, being uninformed as to the actual market conditions, often allow their apples to hang on the tree or else sell them for practically nothing. The writer proposes in this paper to show practical methods of marketing that will, if put in practice, help to solve this vital question of marketing in Missouri.

Investigation of the markets of the two prin-

cipal cities of the state shows that much of the fruit sold to the fancy trade is from sections from twelve to twenty-five hundred miles distant. Many of the best Missouri orchards are within a radius of less than one hundred miles of these centers of consumption. The fruit in the Missouri orchards is being allowed to go to waste. The dealers are not blamable for this condition; they buy what their trade demands. If the trade is willing to pay the freight for these distant shipments in order to get the best fruit, the dealer must cater to them. The only superior quality that the Northwest apple has over the Missouri grown apple is mechanical - that is, it has been properly handled. The latter is of as high quality at the time it leaves the tree. It is at this point in marketing that we fail to compete with time of picking, careful handling, and scientifically shipped fruit produced in other regions.

It will require a complete reorganization of our present orchard operations to place the Missouri apple where it rightfully belongs. It is an economic factor that requires any class of men to change their business methods. In the past Missouri farmers were more prosperous, because land values were increasing rapidly, not from a productive point, but from an unearned increment. In the latter case they were not forced to have their land reach its maximum productive capacity.

OVERPRODUCTION.

Have we reached our maximum consumption of apples? Many of the less informed growers of this state will answer this important question in the affirmative. Many orchardists of Missouri often give overproduction as the reason for destroying their orchards, and using the land for general farm purposes, believing that apples will be cheaper and in less demand in a few years than at the present. The following data from the 1910 Census of the United States will affirm me in saying that it is the lack of proper distribution and not overproduction that is responsible for this condition.

<u>Year</u>	<u>Population</u>	<u>Year</u>	<u>Production of Apples</u>
1900	77,994,575	1899	175,398,000 bbls.
1910	91,972,266	1909	147,592,200 "

The above table shows that the per cent increase in population for the decade was 21, while the per cent decrease in the production of apples for the same period was 15.9. The increase in population for the decade previous was not as great as the one cited. The per cent decrease in production of apples was markedly less, showing a wider gap between production and population. If a census were to be made in 1916, the ratio would probably be wider than the one cited above. In Missouri this would especially be true, since many orchards have been cut out by

their owners; also diseases and insect pests have destroyed many of the uncared for orchards. These figures are for only one year, but this is the best information that the writer is able to secure.

In the decade of 1890 to 1900 many commercial orchards were planted in the Ozark region of Missouri, because a few of the pioneers had made a marked success with the apple business. Little attention was given to the selection of the site, fertility of the soil, available water for spraying, and other points that are now necessary in the proper orchard management. At that time these points were not essential, because the district was new and had not become infested with our present pests. The success of these men lead others to invest capital; real estate men were attracted to the opportunities of this section; city agriculturists were also attracted. The investments have not proven profitable because the owners have not given proper care to their holdings. This lack of attention to the vital points in orchard management has made the cost of production almost prohibitive.

The sale of fruit will not justify this overhead expense of orchard management. Many orchards of this type have been, and eventually all will be, replaced by other lines of farming. The foregoing statement does not mean that some of the orchards in the Ozark region are not profitable; it has reference only to such orchards as were describ-

ed. This does not lessen the value of Missouri as a fruit state, because many of the plantings were held by companies who knew nothing of orchard management, and would not give proper attention to their plantings. The apples that were grown in such orchards were usually marketed in bulk, and dumped on the market to be sold for any price the shipper could obtain. Such conditions led to glutted markets and fruit that had been properly raised was sacrificed because of this class of competition. The sooner such orchards are replaced with other agricultural crops, the higher will be the status of orcharding in this state.

PRODUCTION IN ITS RELATION TO MARKETING.

Production is a preliminary step in marketing. In order that apples be worthy of the best care on the markets, they must be properly produced. The slipshod method in production is as vital a point, in the Missouri apple business, as it is in marketing. The majority of Missouri apple growers do not appreciate the importance of the limiting factors controlling production. It is the aim of the writer to present briefly a few points that are essential in the production of marketable apples.

1. Careful selection of desirable varieties that will meet the demands of the trade.
2. Adaptability of the various Missouri soil types in their relation to apple production.
3. Planting, cultivation and general care of

the orchard until it reaches bearing age.

4. The economic methods of pruning and renovating an orchard.

5. Spraying in its relation to production of marketable apples.

6. The value of thinning in the production of fancy apples to supply a high class trade.

THE RELATION OF VARIETIES TO PRODUCTION.

Each group of apples has a definite local adaptation that must be considered before a commercial planting can be most profitable. The York type, for example, will produce better than any other group, on a poor, burnt-out south slope, while the Winesap group requires a deep, rich soil for best development; it cannot be grown profitably on the type of soil that the York prefers. The adaptation of varieties to local conditions must be considered in planting an orchard, as well as the selection of soil, and other points which will receive further consideration.

The market demands a certain quality of fruit. If the grower does not intend to cater to any certain class of markets, it may be well for him to plant varieties of low quality, because of their productive abilities. However, the grower who intends to make the most out of his planting is the man who caters to a so-called fancy trade - the trade will demand the highest quality obtainable. It is a general rule that the higher the quality, the higher the price, per

bushel. It may, in some cases, be more economical for the orchardist to grow a lower quality apple, because local conditions will not permit the better types to produce profitably on his soil. The Ben Davis apple has been an orchard insurance for many Missouri growers, because of its regular bearing habit. It usually yields, for example, larger quantities of fruit with a less amount of care, than does the Jonathan.

The writer will endeavor to establish the fact that where possible to grow the higher quality apples, it will be more profitable to do so. Missouri growers at the present time, in general do not use methods of marketing under which a smaller quantity of fruit per tree will be more profitable than a larger quantity of an inferior grade. To many of them, one bushel of apples has equal value with another. Under proper methods this condition is not true.

The Jonathan is one of Missouri's highest quality apples. It is a rich, deep red fall apple and will command respect equal to or above any other variety. Many growers have a few acres of high quality apples and use them as a barter to sell other varieties which are inferior in quality. The buyer is usually willing to pay a premium for the entire crop from an orchard, in order that he may get these high quality apples. He would pay more for the high quality apples, if he was not obliged to accept the poorer ones.

The Winesap, Stayman Winesap, Delicious, Rome, Grimes Golden, and many other varieties are medium to high in

apples.

9. Standardization of the package is a prime factor in the preparation of a standard product.

10. The box should be used in handling certain grades and varieties of Missouri apples.

11. Storage has lengthened the market season more than 200 per cent.

12. Systematic advertising will materially increase consumption.

13. The best method of sale is at the car.

14. The co-operative association is the most efficient marketing agent.

15. The proper utilization of culls will materially increase the returns to the grower.

ACKNOWLEDGEMENTS.

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May 13, 1916

Dean Walter Miller,
Columbia, Missouri.

My dear Dean Miller:

I herewith transmit the thesis prepared by Mr. Maurice Eugene Hays, B. S. A., on "Methods of Marketing Missouri Apples," submitted in partial fulfillment of the requirements for the degree of Master of Arts in the Graduate School.

I take pleasure in submitting the same with my approval and to state that Mr. Hays has fully completed the requirements of the Department of Horticulture, for graduation, other than the preparation of the thesis.

Very truly yours,

A handwritten signature in cursive script, reading "W. H. Lawrence". The signature is written in dark ink and is positioned above the printed name of the sender.

Professor of Horticulture.

University of Missouri - Columbia

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quality, and are well adapted to Missouri conditions. These varieties will sell on the market from 5 to 10 per cent lower than the Jonathan, as a rule, and from 25 to 50 per cent higher than the Ben Davis group. The Winesap group is especially well adapted to Missouri conditions. Many Winesap seedlings, which have proven to be our standard commercial varieties, originated in Missouri and Northern Arkansas. The more common and useful of these are the Mammoth Black Twig and Arkansas Black.

THE RELATION OF SOIL TO PRODUCTION.

One of the most vital points to be considered in the selection of an orchard site is the soil. An old idea prevailed, in many sections of the United States, that if land would not produce anything else, it could be planted to apples. Fortunately, for the success of the orcharding industry, this idea has been abandoned. Apples require a rich, well drained soil for best development. They have a special adaptation as to drainage, which must receive due consideration. The soil must be porous to permit subsoil as well as surface drainage, and also to allow the roots to penetrate readily. The subsoil is of more importance with fruit trees than with any of the general agricultural crops. More attention must be given to the selection of a site for orcharding than for general farm crops, because when a selection has once been made, and the trees planted, it is permanent; there can be no changing of the orchard from one part

of the farm to another, as is the case with other crops.

In Missouri there are eight general types of soil, as shown by the chart on the following page. The types given are obviously general, and all soils within a given area are not as the description for that area represents them - that is, we may find within a section, many different types of soil in small areas.

We find that some of the soils in all sections are adapted to fruit, and some of the soils in fruit sections are wholly unsuited for fruit growing, because of local conditions, such as drainage, soil fertility and other factors.

The Loess. The loess is one of the best fruit soils in the world; it is a soil without a subsoil. There is a wide belt of it in the northwest part of the state, and also along both the Missouri and Mississippi Rivers. This soil is of alluvial formation. It is very fertile, light and porous, with almost perfect drainage. Roots penetrate to a depth of 100 feet in some cases. The value of the loess soil for agricultural purposes is shown by the following example: Soil taken from the bottom of a well, 40 feet deep, at McBaine, Mo., was spread over an alfalfa field at a depth of from 2 to 5 feet, before the alfalfa seed was sown. The alfalfa grew on this area as it did on any other part of the field. The value of this soil is just beginning to be fully appreciated by the fruit growers of this section; it compares favorably with soils where fruit growing is the main industry.

The Flat Prairie Loam. This is a very poor

SOIL TYPES.

Fig. 1 Soil Chart

fruit soil. The top soil is very fertile but the subsoil is quite hard and almost impervious to the penetration of roots. It is good land for the production of general farm crops, but is not profitable for the production of apples; Columbia is located in this area. There are many orchards in this section of the state, but few commercial orchards that are profitable.

Shelby Loam. This loam is of glacial origin. It is much like the Flat Prairie Loam with the exception that the subsoil is not as impervious to the penetration of roots. This comprises the leading section of the state for general grain and stock farming. In certain parts of this section we find some very good commercial orchards.

The Silt Loam. This loam is of the Summit, Oswego and Cherokee series. This section has a hard-pan subsoil, and toward the eastern boundary is very low in fertility. The northwestern part of the section is of the same general character, but much higher in fertility. Again we find a good type of soil for general farming, but not for orcharding.

The Crawford Red Limestone. The Crawford Red Limestone is the second best fruit soil in this state, and is the best of the Ozark fruit soils. This section comprises practically all of the fruit region in Southern Missouri. We find commercial plantings in other types, but, as a rule, they are not as profitable as those in this series.

The Clarksville Gravelly Loam. This is very low in fertility, yet it has about the same drainage capacity as does the loess. Fertilizers must be added in order that a sufficient amount of plant food may be available to make apple production profitable. This makes the cost of production almost prohibitive and it is not advisable to use it for tree fruits.

Swamp Lands. The so-called swamp land of Southeast Missouri is of very little value in fruit production, because of drainage. The fertility is high.

The Union Silt Loam. This is of limestone origin, containing little gravel. It has a heavy red clay subsoil, low in fertility, the latter factor limiting its use as a fruit soil.

ORCHARD MANAGEMENT IN ITS RELATION TO PRODUCTION.

Too little attention is usually given to the planting operation. The preparation of the land should begin the season before planting. A deep rooted leguminous crop is the best to get the land in proper condition for tree fruits; it not only adds fertility to the soil, but also tends to hold the weeds in check. The land should be as carefully cultivated as for other farm crops.

The practice of digging the holes the same size for all trees should be discouraged. Each hole must be dug for the individual tree and not make the tree fit the hole; do not allow the roots to bend in the hole. This point

applies only to the inexperienced grower. The distance and system of planting must be adapted to suit the local conditions of each orchard.

The planting can be done either in the spring or autumn. The latter has proven to be the most desirable, according to results obtained after of number of years' work at the Missouri Agricultural Experiment Station. The principal advantage of autumn planting is that the trees become established over winter and will usually gain from one-half to one year's growth over the spring planted trees in this section.

Cultivation.

The young orchard should have clean cultivation for the first part of the season, then planted to some legume which would be plowed under in the fall or allowed to stay on the ground over winter and plowed under in the spring. This condition would be ideal for the growth of the tree. However, the average owner must realize something from his planting, and, in this case, it is possible to grow truck crops at a profit to the owner, and also be a benefit to the orchard. This system will require clean cultivation throughout the season, which allows the trees to receive cultivation as well as the truck crops for which this work is primarily intended. In case he does not have a market for truck crops, the orchardist may rotate with corn one season and cow peas or soybeans the next. This system will just about maintain the soil fertility, and improve its mechanical condition without addi-

tional expense to the operator - that is, the profits from the crops will bear the expense of the work. Where the land is rolling, there must be a cover crop in winter to prevent washing. The best cover crop for Missouri conditions is rye. This can be sown in early fall, allowed to stay over winter and turned under in the spring.

The orchard should receive continuous cultivation until it reaches bearing age, at least; then, if possible, cultivation should be continued without the use of intercrops. If this is not possible, it should be planted to clover or alfalfa.

Pruning.

Pruning should begin at the time of transplanting. Both roots and tops are severely pruned. In training a young tree the ideal form should be constantly kept in mind. Heavy pruning causes vegetative activity, at the expense of fruit production.

Orchard renovation must be practiced in those sections where neglected orchards occur. These orchards could be made profitable, if proper methods of renovation were given. Such work should begin in summer when the trees are in leaf. At this time it is easy to distinguish the strong and weak limbs. By renewing the vigor of such trees it is possible to materially lengthen their productivity.

Many Missouri orchards are badly infested with canker; this is a fungous disease which can be held in check by proper sanitary methods. The same may be said concerning

fire blight, which is due to a species of bacterium.

Spraying.

There is no single orchard operation so essential to the production of marketable fruit as spraying. The theories of pest control by other means have been abandoned. Growers have realized that spraying must be done in order to produce marketable fruit. The day of selling worms at a profit has passed.

The number of applications depends on the pests that must be controlled and also the climatic conditions. Generally for apples in Missouri, the following sprays will control the common troubles: the dormant spray for San Jose Scale, when present; the cluster bud spray, with a standard fungicide, for scab; the calyx spray, primarily for codling moth and apple scab - this must be a combination spray of arsenate of lead and lime-sulphur. The third summer spray is applied about ten to fourteen days after the second, using the same material. In the southern part of the state, it is usually necessary to apply a fourth and fifth summer spray. These are for the control of blotch and bitter rot in addition to the above, and Bordeaux mixture must be used.

The secrets of success in spraying are in the application of the material at the right time, and under a high pressure.

Thinning.

This subject of orchard management comes both in marketing and production. It is a practice that was

started by our western neighbors, and is now more or less in vogue in other sections. To the grower who has not practiced thinning in previous years, it is a hard task for him to begin. Next to cutting out fillers, thinning takes more courage than any other orchard operation.

Apples at thinning time are too small to be of economic value. They are thrown on the ground and allowed to go to waste. It seems to be an endless operation to the orchardist, if he has several hundred or thousand trees, and it takes from two to three hours per tree. At first it does not seem that the profit from the operation would justify the expense; it probably will not, except in case of apples for special trade.

Last season (1915) the writer conducted some thinning experiments for the Missouri Experiment Station, with trees of the Huntsman, Ben Davis and Jonathan varieties. The trees were medium to large in size, about fifteen years old. The work was done on an average of $37\frac{1}{2}$ ¢ per tree, figuring labor at 15¢ per hour. The final data on this experiment was not taken completely (the writer being away on his vacation, the foreman kept an incomplete record). However, observations were made throughout the season that the thinned apples were larger and better colored, and practically free from disease or insect injury.

About one-third of the apples were removed from each tree. In each case a cluster of fruit was thinned to

one apple. This is very essential to remove the danger of second brood codling moth infestation. The amount of time required will vary with the size of the tree; in the case of well pruned trees, the work can be done much more rapidly than in very woody trees.

Thinning Experiment.

Table I.

Varieties Thinned, Number of Apples Removed, Distance Apart and Cost.

Date	Variety	No. of apples taken out	Distance apart inches	Time required hours	Cost at 15¢
6/16/15	Huntsman 86	1313	5-8	2½	37½¢
6/17/15	King David 741	1080	3-6	2	30 ¢
6/17/15	Jonathan 543	738	5-8	3	45 ¢

Table II.

Results of the Experiment.

Variety	Treatment	No. of apples	Weight of apples	Average weight
Huntsman 86	Thinned	2,396	643 #	.268#
Huntsman 87	Unthinned	3,623	875	.238
King David 741	Thinned	1,371	331	.241
King David 740	Unthinned	2,656	565	.212
Jonathan 543	Thinned	2,046	606.5	.296
Jonathan 545	Unthinned	2,725	785.5	.288

The preceding table shows that in each case the trees that were thinned produced larger apples, the small ones being eliminated. This is only one of the important factors that are controlled by thinning. The table does not show the increase in color and perfect condition of the fruit.

There are few operations that will pay the grower any greater net returns than thinning for fancy trade. There are numerous advantages as to why the thinning operation will pay the grower. Some of the principal ones are as follows:

1. Fruits that are injured by insects or diseases can be removed at this time, thus keeping these pests from injuring the other fruits. The apples that are thinned off the tree are allowed to lay on the ground or else consumed by hogs thereby destroying the pests.

2. Thinning undoubtedly improves the quality of the apple. There is in all cases recorded a higher per cent of extra fancy fruit on thinned trees.

3. Thinning will prevent the trees from breaking. In case of a very heavy crop, this work will more than pay the cost of repairing the injured trees.

4. Thinning will be a tendency to regulate the bearing habit of the tree, inducing annual rather than alternate bearing.

5. The color of the fruit is also improved.

This operation can be done at a time when other orchard work is not rushing. The usual time to begin

the work of thinning is after the "June drop" has passed.

How much thinning must I do? How much will it cost? are the two first questions that arise when you talk to growers about this practice.

This will depend on the varieties grown, the price of the labor, the amount of fruit on the tree, previous pruning and market demand. There is no definite rule that can be given to any orchard operation that would apply in all sections. Thinning is no exception. In general it is safe to say, never leave more than one apple in a cluster, and do not have apples closer than 6 inches on a twig. In case of a heavy "set" all apples should be removed from each alternate spur.

Methods of Thinning. There are three practices used by commercial growers.

Summer Pruning. This method is accomplished by the use of pruning shears and a pruning knife, and is a practice used where two operations - i.e. pruning and thinning - are combined. It has the advantage of being a cheap way to cover the orchard, and can be used to lighten the load of the tree. The chief objection to this method is that the operator is not able to reduce the number of apples in the cluster.

Thinning Shears. The use of a light pair of thinning shears is the practice most generally followed by commercial growers. The shears are especially constructed for this practice, and make it possible for the work to be

done very rapidly. The work is usually done by boys and can be cheaply done.

Hand Thinning. The third method is removing the apples by hand. In this practice great care must be exercised, especially in removing the apples from a cluster in order to avoid injury to the remaining specimen. This is a much slower method than the shear thinning operation.

THE RELATION OF CAREFUL HANDLING TO MARKETING.

Picking, as generally accepted, is the first step in marketing. In sections where the fruit business is properly organized by co-operative associations, the producer's control stops when the fruit is ready to pick. The California Fruit Exchange, the most powerful marketing agent in the United States, takes the fruit on the tree, for the reason that they are in better position to enforce their picking, grading and packing rules than if the growers were doing the work themselves. The men are paid by the association whose rules they are to enforce.

Many commercial buyers prefer to purchase fruit on the tree in order that it may be properly handled. They also have another point of view in some cases - that of out-guessing the grower in regard to yield.

When to Pick.

The first point to be considered in the picking of fruit is the stage of maturity. If apples are picked too green, they will be under-developed, lacking in size, quality

and color. They are also more susceptible to storage injury. Fruit which is over-ripe will become "dead," and lose its fresh crisp quality.

The question of just when to pick fruit cannot be answered definitely. Different seasonal conditions will modify the dates, for the same variety, in a given section. The market in which the fruit will be distributed is also a determining factor, as to the time of picking. If the fruit is to be consumed immediately after picking, it can be allowed to stay on the tree for a longer period than if it is to be shipped to a distant market, or put into storage.

How to Pick.

Fruit is a living organism, and must be handled as such. Do not injure or bruise it in any way. Apples are borne on fruit spurs, and by careless work on the part of the pickers, with their ladders, many of these will be broken off. The stem of the apple must be left intact; by a little practice this can be easily done. A short twist will separate the stem from the twig without removing the former. An apple without the stem is an injured specimen. Never allow enough pressure in gripping an apple to injure the fruit. Carefully place it in the container; do not drop it in on other fruit or on the bottom of the receptacle.

Harvesting Apparatus.

The general picking equipment used in Missouri is not adequate for the proper handling of apples. The

ladders used are ordinary ones resting in the tree. Even with the most skilled labor it is impossible to prevent injury to the tree. A tripod form or an ordinary step ladder should be used. Two tripod ladders on opposite sides of the tree with a heavy board across the top will enable the pickers to reach the center of the tree without climbing.

The picking should not be done in a sack, because there will be some injury to the fruit regardless of how carefully the work is done. It is impossible to place fruit into such a container without some bruising.

The best type of picking utensil is a galvanized pail with canvas bottom.

There are numerous patented baskets and pickers on the market, but these, as a rule, have proven unsatisfactory. They are expensive and will cause more or less injury to the apples.

Field Boxes. There should be a field or lug box. The mistake of using packing boxes to haul fruit from the field to the packing sheds, is often made; the chief objection to this method is that the boxes get dirty and often broken. These boxes are not made for this purpose and they cannot be conveniently handled without bruising the apples. Two types of field containers are shown in Figs. 2 and 3. The barrel is sometimes used as a field package, but is not satisfactory for the reason that it is impossible to put apples in a barrel without some bruising; also the expense of the

Fig. 2 One type of field box used in Missouri.

This is not satisfactory because of
slatted sides which bruise the fruit.
It is also too deep.

Fig. 3 A very satisfactory type of field box.
Note the strength of this box.

barrel is too great to justify its use as a field package. If the barrel is filled, it is too heavy to properly load and unload without dropping, therefore bruising the apples.

Orchard Trucks. The fruit should be hauled from the field to the packing shed in an auto truck or a spring wagon. If a farm wagon is to be used, it should have a spring bolster under the fruit frame. The frame should be as low as possible to facilitate ease in loading. Fig. 4 shows a satisfactory type of automobile truck for hauling apples from the field.

Management of Pickers.

The pickers should be paid by the day; if they get so much per box or basket, there will be a tendency to fill their containers regardless of all other factors. Little care will be exercised in careful handling of the apples and there will be a greater amount of injury to the tree. The average community, where fruit growing has an important place, has to import pickers. These pickers, or "squirrels" as they are called, are usually a very poor type of labor; they are the street loafers who will do practically no work at other times. They like to be in large gangs of men where they can have a good time. The orchardist must have definite rules for them to follow, and a strict foreman to see that these rules are obeyed.

One Missouri grower who is very successful in the apple business, has adopted a set of rules. The ones applying

Fig. 4 A good auto truck for hauling apples.

to the preparation of fruit for market, together with the writer's comment, are given below.

1. Do not throw apples. The principal reason for this rule is, if one fellow starts throwing apples, in a few minutes every picker is enjoying a free-for-all. This not only wastes time for the grower, but much fruit is knocked from the trees, and goes to the cull pile.

2. Do not throw apples into the container. The careless operator will bruise an unreasonable amount of fruit.

3. Do not pull out stems. Stemless apples cannot be placed in extra fancy packs.

4. Pour in, not drop into the field box. Many pickers will stand up straight and drop apples from two to three feet into the field box.

5. Do not drop the filled picking container from the ladder.

For the infringement of any of these rules, he has fixed a fine of 25¢, or, if the picker continues such practices, he is "fired." Such rules seem, off-handed, to be a little severe, but with the class of labor used some such scheme is necessary.

The foreman is responsible to the owner to see that the pickers adhere strictly to these rules.

The enforcement of the rules is most easily accomplished by organizing the pickers into gangs. Let the old men, women and girls pick from the ground; then the young men

and boys pick from ladders; the light weight men may be assigned to the use of long, light ladders.

After the fruit has been picked, it should be sent to the packing house as soon as possible. Never allow it to stand in the sun without a covering.

GRADING.

Grading is the most exacting of the market operations. Dealers contend that the farmers are crooked; they always pick out the large apples for the top - this is especially true in the case of barrel packing. The facers are always good, while poor specimens are placed near the center. Unfortunately this is true of a very large number of our Missouri growers. The farmer eases his conscience by believing he is shipping to a merchant who will try to beat him in the transaction; he figures if he can market by this method it is to his advantage. This misunderstanding between grower and dealer is a serious drawback in marketing.

Upon examining the packs in the different sections of the state, the writer has been impressed with the difference in the size of the cull pile where the buyer does the grading, and where it is done by the farmer. It is apparently more difficult for the farmer, than for the buyer, to see a small defect. The farmer knows if he discards a specimen, it will be a loss to him; on the other hand, the dealer realizes that if he allows such specimens to go into a package, the customers will find them and he will be forced to cut the price,

therefore it is to his advantage to cull accurately.

Grades regulate the price. The size and perfect condition of the apple will not always sell the package. If 10 per cent of the fruit in a particular container is below standard, it will be sold at the price of the next lower grade. A few good apples will not raise the price of a package.

The package used is the determining factor in grading apples. For box packing the requirements are more strict than they are for barrel packing. There are three grades recognized in packing apples - extra fancy, fancy and "C" grade. A combination of the first two is often packed as "Orchard run."

The following grading rules were adopted at the Grading Rule Congress, held in Spokane, Washington, April 28, 1915.

Apples

I. "First Grade", "Grade No. 1", or "Extra Fancy," are defined as sound, smooth, mature, clean, hand-picked, well-formed apples only, free from all insect pests, diseases, blemishes, bruises, and other physical injuries, scald, scabs, scale, dry or bitter rot, worms, worm stings, worm holes, spray burn, limb rub, visible water core, skin puncture or skin broken at stem.

The following varieties shall be admitted to this grade, subject to the color requirements specified:

A. Solid Red Varieties.

Aiken Red	King David
Arkansas Black	McIntosh Red
Baldwin	Spitzenburg (Esopus)
Black Ben Davis	Vanderpool
Gano	Winesap

must have not less than three-fourths good red color.

Jonathan

must have not less than two-thirds good red color.

Black Twig	Missouri Pippin
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must have not less than 50 per cent good red color.

B. Striped or Partial Red Varieties:

Delicious	Stayman
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must have not less than two-thirds good red color.

Ben Davis	Wealthy
Hubbardson None Such	Rome Beauty
Jeniton	Ranier
Kaighn Spitzenburg	Snow
Northern Spy	Wagener
	York Imperial

must have not less than 50 per cent good red color.

Gravenstein	Jeffrey
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King of Tompkins Co.

must have not less than one-fourth good red color.

C. Red Cheeked or Blushed Varieties:

Hydes King	Red Cheek Pippin
Maiden Blush	Winter Banana

must have a perceptible blushed cheek.

D. Yellow or Green Varieties:

Grimes Golden	White Winter Pearmain
Yellow Newton	Cox's Orange Pippin

must have the characteristic color of the variety.

II. "Second Grade", "Grade No. 2", "Fancy", are defined as apples complying with the standard of first grade apples, except that slight leaf rub, scratches or russeting shall be permitted up to a total of one inch in diameter in counts running 125 or less to the box, or three-fourths of an inch in diameter in counts running from 138 to 163 to the box; and one-half inch in diameter in counts running 175 or more to the box; and limb rubs will be permitted showing an aggregate area in the various counts of one-half of that allowed for leaf rubs, providing that no apple will show total blemishes aggregating more than 1 inch in diameter in counts running 125 to the box or less; more than three-fourths inch in diameter in counts running 138 to 163 to the box and one-half inch in diameter in counts running 175 to the box or more. No clearly misshapen or bruised apple or apples bearing evidence of rough handling shall be permitted in this grade.

The following varieties shall be admitted to this grade, subject to the color requirements specified:

A. Solid Red Varieties:

Aiken Red	King David
Arkansas Black	McIntosh Red
Baldwin	Spitzenburg (Esopus
Black Ben Davis	Vanderpool
Gano	Winesap

must have not less than 40 per cent good red color.

Jonathan

must have not less than one-third good red color.

Black Twig	Missouri Pippin
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must have not less than 25 per cent good red color.

B. Striped or Partial Red Varieties:

Delicious	Stayman
-----------	---------

must have not less than one-third good red color.

Ben Davis	Ranier
Hubbardson None Such	Snow
Jeniton	Wagener
Kaighn Spitzenburg	Wealthy
Northern Spy	York Imperial

must have not less than 25 per cent good red color.

Gravenstein	Jeffrey
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King of Tompkins Co.

must have not less than 10 per cent good red color.

Rome Beauty

No specific color requirement is defined for Rome Beauty in this grade, other than that each specimen must show a perceptible

blush or overspread of reddish color characteristic of the variety; except that Rome Beauty apples of 96 size and larger shall be admitted without color.

C. Red Cheeked or Blushed Varieties:

must have correct physical quality with tinge of color.

D. Yellow or Green Varieties:

must be of the characteristic color.

III. "Third Grade," "Grade No. 3," or "C" grade apples shall consist of mature apples free from all insect pests, worms, worm holes, infectious diseases, skin punctures, bruises, or broken skin, but slightly misshapen apples, or those having sun scald, not to exceed two healed-over stings, and the blemishes allowed for Second Grade apples shall be permitted, and there shall be no requirements as to color.

IV. "Combination Extra Fancy and Fancy," grade. When first and second grade apples are packed together, the packages must be marked "Combination Extra Fancy and Fancy."

Combination grade may also include all other varieties not provided for in First and Second grades.

When First, Second and Third grade apples are packed together, the packages must be marked "Third Grade."

When First, Second and Third grade apples are packed together, the packages must be marked "Orchard Run," but Orchard Run packages must not contain any apples that would not meet the requirements of Third Grade.

V. Summer and Fall Varieties. Such varieties
as:

Astrachan	Bailey's Sweet
Bietingheimer	Duchess
Early Harvest	Red June
Strawberry	Twenty Ounce Pippin
Yellow Transparent	

and kindred varieties not otherwise specified in these grading rules, together with early fall varieties such as:

Alexander	Blue Pearmain
Wolf River	Spokane Beauty
Fall Pippin	Waxen
Tolman Sweet	Sweet Bough

and other varieties not provided for in these grading rules, as grown in sections of early maturity, shall be packed in accordance with the grading rules covering Fancy grade, as to defects, but regardless of color rules.

The above rules are adapted to our Missouri conditions. We, in Missouri, have not advanced as far as our Northwestern neighbors in the matter of handling and marketing apples. It would be well for us to adopt their rules with such minor changes as our local conditions may require at this time. In general, however, the adoption and strict adherence to these rules would be for the betterment of the apple marketing situation in Missouri.

Enforcement of Grading Rules.

The enforcement of the rules lies largely with the grower. Education is the most important single factor in the enforcement of rules. The most difficult task is to convince the grower that the rules are written to guide his actions and the dealers are not necessarily benefitted thereby.

In sections where the apple business is well organized the enforcement of the rules is left to the association of which the grower is a member. Inspectors are appointed and held responsible to the association for the strict enforcement of the grading rules. The inspectors are paid by the association and it is to their interest, in order that they may hold their positions, to strictly enforce the rules. If the inspectors are directly responsible to the association, they will render a more efficient service than if appointed by the association and paid by the grower.

Grading for Barrel Packing.

The box is a more serviceable package than the barrel. Apples to be packed in barrels, however, should be carefully graded. The United States Apple Grading Law specifies as follows:

"Sec. 2. That the standard grades for apples when packed in barrels which shall be shipped or delivered for shipment in interstate or foreign commerce, or which shall be sold or offered for sale within the District of Columbia, or the Territories of the United States shall be as follows:

Apples of one variety, which are well grown specimens, hand picked, of good color for the variety, normal shape, practically free from insect and fungous injury, bruises, and other defects, except such as are necessarily caused in the operation of packing, or apples of one variety which are not more than ten per centum below the foregoing specifications shall be "Standard grade, minimum size two and one-half inches," if the minimum size of the apples is two and one-half inches in transverse diameter; "Standard grade minimum size, two and one-fourth inches," if the minimum size of the apples is two and one-fourth inches in transverse diameter; or "Standard grade minimum size two inches", if the minimum size of the apples is two inches in transverse diameter."

While this law is the first legal step in the right direction, there are many defects. The chief one is, it shall contain apples "practically" free from worms, scab and other injuries, which of course means very lax methods in grading. The grower usually takes pains to pack the apples so there will be at least 10 per cent fruit below standard, consequently the percentage usually runs above the maximum allowed by law. It is very evident the purpose of this clause was to provide for error by the party doing the grading. In order to force the situation in proper packing there should be a law passed that would insure a package of apples as represented. This would be a benefit to the consumer and the producer as well.

Mechanical Graders.

There are a number of mechanical graders used in this state. They have not played an important part in our orchard operations, since they grade to size only, and the sorting for color, blemishes, insect injury and fungous disease must be done by hand. An apple grader facilitates handling labor, which is a very important item during the packing season, since labor is expensive and scarce. The graders, as a rule, size accurately enough for box packing. The types are being improved each season and it is hoped that one will be perfected that will prove satisfactory.

METHODS OF PACKING.

Where to Pack.

Fruit is packed either in the field or in a packing house. Packing in the field is the more common procedure in Missouri. The packing crew moves from tree to tree with the pickers, the latter carrying the apples to the packing table, thereby avoiding loading and hauling to a packing shed; one handling of the fruit is thus eliminated. The fruit is graded in the open and no provision is made to protect it from the weather; the picked fruit stands in the picking utensils until placed on a packing table. Little attention is given the fruit to prevent heating before it is placed in the package, and when it is placed in large packages it takes hours or even days, unless placed in storage, for the apples in the center to cool. This practice is obviously very detrimental to the keeping

qualities of the fruit and should be discouraged. It is perhaps true that packers do not work as carefully in the field as they will in a packing shed. It is very wasteful of time to allow the pickers to carry the fruit to the packing table. It is also impossible to provide conditions in the open favorable for economical packing, especially where the packing crew is moved frequently. Best results are secured where the crew works the entire season in one place.

Picked fruit should be hauled to the packing shed during the day to prevent dew from falling on it in the open at night. In case rains wet the fruit, it must be repacked. Generally speaking the practice of field packing should be discouraged under all conditions, and the packing should always be done under cover.

The Packing House. The essential features of a packing house are space, cleanliness and light. The house should be a permanent structure, if possible for the grower to construct such a building. The house should be large enough to accomodate the maximum crop of the orchard. Fruit brought directly from the field to the packing house should be stored in the room for field packages. A grading and wiping room or section should be large enough to make it possible for the people doing this work to render greatest efficiency. The packing division should be roomy to avoid crowding. There should be a store room provided for storing empty packing boxes, also the packed boxes until they can be hauled to the shipping point or placed in storage.

Keep the packing house clean by removing, daily, all rotten fruit and cider stock; cleanly quarters is a stimulus to the men to handle the fruit more carefully and especially to keep it clean. The packing boxes also should be kept clean, as this adds greatly to their attractiveness when placed on the market.

It is very essential that packing be done carefully, and for this reason the work shed should be as light as possible; if there is not ample light the work cannot be done so accurately or rapidly. In good weather much light can be obtained by leaving the doors open; this is practical, however, only under the most favorable weather conditions. Sufficient window space must be provided to allow plenty of light, under conditions where it is not feasible to have the doors open.

Many Missouri orchardists are not financially able to build a packing house. Fig. 5 is a good illustration of a shed with a tent cover. The chief expense, which is quite reasonable, is the rent for the tent.

Packing House Equipment. The packing table is one of the most important features in the packing house. A very satisfactory type is shown in Fig. 6. This table has a burlap top. Apples sorted to size and grade are poured on the table. The grading table, also lined with burlap to prevent bruising the fruit, should be convenient for the work of the graders. The nailing press is also an essential part of the packing house equipment, and the type shown in Fig. 7. is one

Fig. 5 A cheap but very desirable tent packing shed.

Fig. 6 A very desirable table for box
packing. Note the paper hods
on the side of the box.

Fig. 7 An exceptionally desirable type of nailing press.

of the most satisfactory; with such a press it is possible for the work to be done quickly as well as economically. The other accessories for box packing are paper hods, to be hung on the side of the box, as shown in Fig. 6.

For barrel packing another type of table must be used. It must be higher in the back than at the front to allow the apples to be placed on and rolled toward the front. At the front end, which is narrower than the back, a canvas sack should be provided in order to lower the apples into the barrel with the least possible bruising.

The press used for heading barrels is shown in Fig. 8. It has the advantage of having a circular iron band which allows the pressure to be evenly distributed throughout the barrel and not on a few of the top apples, which is common with the bar type of press.

How to Pack.

The method of packing must depend very largely on the market to be reached, on the quality of the fruit and on the package to be used.¹ The package is the determining factor in packing. The more expensive the package, the more exacting the pack. Methods used in barrel packing will not apply to box or carton packing.

Packing the Carton. The carton is the most exacting of the apples packages. In grading for carton packing, size is not the only requirement; the apples must be

¹ Bailey, L. H. - Principles of Fruit Growing, p.392.

Fig. 8 A very convenient type of barrel press.

further sorted for color markings. The fruits must be as nearly uniform as it is possible to obtain them. There are very few fruits in a package and it is essential that every one be marketable. The apples are easy to pack in cartons, since the package contains so few fruits; also many of them contain individual sections for each apple - this prevents the fruit from bruising. All specimens should be carefully wrapped; this additional trouble will pay large dividends and also afford a splendid opportunity for advertising. If the name of the grower and the brand of fruit is printed on the paper with which the fruit is wrapped, it will reach the consumer direct.

Box Packing. There are two general systems of packing apples in boxes - the straight pack and the diagonal or off-set pack. The packs are named according to the number of apples and the way they are placed in the layers; for example, 3 X 3, 3 X 2, 1 X 2, etc.

The straight pack is used in packing very small and very large apples. This method is meeting with less favor each season; it is more difficult to prepare and is more injurious to the fruit than the diagonal system, because the pressure of a whole row of apples will be on one apple.

The diagonal pack permits about equal pressure on four points, divided among all specimens of the tier. It is a much easier pack than the straight pack.

The essential points for the packer to master are to quickly size and know just what system to follow. If

he has apples on the table that will pack out 84 to the box, he must know just how to start this pack. The starting and finishing of a pack are points that greatly confuse the amateur packer. Practice only will enable the operator to master the art of box packing. Fig. 9 shows a properly packed box.

Wrapping the Apple. All extra fancy apples should be carefully wrapped with thin paper especially prepared for the purpose. The paper for average sizes is 8 by 10 inches, smooth on one side and rough on the other, with the rough side next to the apple. The wrap prevents rapid spread of decay and keeps the fruit clean; it also affords an excellent opportunity for advertising since the wrappers go direct to the consumers. The experienced packer can wrap a box of apples and pack it as quickly as he can without wrapping, since the wrapped fruits pack more easily and there is less danger of irregular alignment. The fold of the paper is over the stem end, so placed to prevent the stem from piercing the skin of the apple next to it.

Barrel Packing. Honesty is the first essential in successful barrel packing. Too many growers are prone to place a few good apples on the face of the barrel, believing this is necessary to sell the fruit. Buyers have learned the farmer's method of barrel packing, and they inspect the lower layers in a barrel before buying it, to determine if it is faced with "man" size apples, "lady" size in the middle and "childrens" size in the bottom. Such practice must be discarded, if the

Fig. 9 A properly packed box, showing correct bulge before and after nailing; also note paper lining which adds to the attractiveness when opened.

grower desires to be successful in marketing his fruit from year to year. While it is true that apples do not have to be as carefully sized for barrel as for box packing, it is essential in barrel packing to avoid a variation in diameter of more than a half inch. When two and a half inch are packed with three and a half inch apples, the package will sell for less than if the specimens were all two and a half inches in diameter. Apples for barrel packing should be as free from worms and diseases as those placed in boxes. It is very important that the fruit be carefully racked while packing in order to obtain as tight a package as possible so it can be handled without unnecessary bruising.

A cardboard top is sometimes placed over the apples and against the head to prevent bruising. These boards also add to the attractiveness of the package. They indicate that the grower takes pride in the preparation of the product. Some growers also use a paper fringe around the top of the barrel, so when the head is removed the top layer will present a very attractive appearance. This method, however, has a very small advertising value. The chief objection to using fancy frills in a barrel is that they are seen only by the retailer.

The packed barrel should be stenciled or otherwise marked, giving the grower's name, variety, grade and size of the fruit. This will enable the retailer to know just what he is getting. A clear, clean stencil should be used with inks that will not present a mussy appearance. Do not

use soiled or second hand barrels; such barrels will greatly hinder the sale of the package.

APPLE PACKAGES.

There are two general methods of disposing of fruit - bulk and pack fruit.

The bulk method consists in delivering the fruit to the consumer at the least possible cost. The package in which it is delivered is retained by the deliverer.

The carton, the box and the barrel are the more common packages in which fruit is sold on the Missouri markets. Each of these types, with the exception of the barrel, is represented by several sub-types. There is a place on the market for all of these packages, each filling a separate function and to a small degree only are they competitors.

The Carton.

The carton is becoming more popular on the markets each year. This package lends itself to a special trade of fruit of the extra fancy grade. It may be of various sizes, holding from one to two dozen apples, and is made of corrugated pasteboard or some other paper products material. The essential points to be considered in the material are lightness and neatness. The carton is used extensively in parcel post shipments. Some growers use it for advertising purposes - that is, they send out a carton containing a sample of their product, together with advertising material and price list. These are feelers whereby the grower hopes to build up a special trade by

means of letting the consumer know what he has to offer.

As a package for large quantities of medium to low quality, the carton has little value. It is the most expensive package on the market for the amount of fruit it contains. It also costs more per apple to grade and pack cartons than any of the other packages.

The Box.

The apple box is rapidly replacing the barrel in many Missouri orchards for the best grade of fruit of certain varieties. Professor E. W. Bailey says "The trend of time in all commodities is toward a smaller package and the box will undoubtedly supplant the barrel."¹ The change in the economics of the fruit business in Missouri has brought about this condition, by competition from other sections. The box should be more widely used in all sections of this state as a package for fancy fruit, and should be the standard package for all apples that are to be sold to the retailer or the consumer in any quantity. Fruit properly packed in a box will reach the consumer in first class condition. There will be less bruising than fruit sold and changed from the larger containers.

The box will tend to increase consumption. If the consumer can be sold a box of good apples, he will use more than where he buys in small quantities. The slogan used by manufacturers of various products is "Buy them by the box."

¹Lowther - Encyclopedia of Practical Horticulture, Vol. I, p.331.

This should be adopted by all the agents that handle apples directly to the consumer. The family of average size can use a box of apples, though late in the season, before they deteriorate. The object of the retailer and producer should be to give the consumer the largest quantity he can economically use and yet leave a taste for more.

Not alone to the producer has the box advantages over the other packages, but to the consumer as well. He gets clean fruit. The quality of each box is guaranteed, or should be, by the producer. There is less waste, therefore less expense to the consumer, than buying fruit at less money for a given quantity and having a larger percentage of this fruit that is not usable. Then the satisfaction of obtaining a sanitary product is sufficient to induce the housewife to pay a higher price for the same quantity.

There has been a great deal of agitation on the part of the producers in some sections to have legislation enacted for a standard box for all sections of the United States. So far this has failed. Such legislation would benefit both the producer and the consumer; it would enable all sections to compete on quantity, leaving each section to excel in quality. The retailer would handle a standard quantity and the consumer would soon learn the value of full measure.

At the present time there are several sizes of boxes on the market.¹ The Northwest Fruit Distributors have

¹Lowther - Encyclopedia of Practical Horticulture, Vol. I, p.227.

Fig. 10 Four types of boxes found on the markets.

two boxes - the "Standard" and the "Canadian or Special." The dimensions for the former are $10\frac{1}{2}$ inches deep, $11\frac{1}{2}$ inches wide, and 18 inches long, containing approximately 2173.5 cubic inches. For the latter the dimensions are 10 by 11 by 20 inches; this box contains 2200 cubic inches. The "Colorado" is mostly used in Colorado and Utah. The dimensions are $11\frac{1}{2}$ by $11\frac{1}{2}$ by $18\frac{1}{2}$, and it contains 2261.625 cubic inches. Still another type is used in the East. This is the box that was considered by Congress in 1914 as a standard for the United States.¹ The box contains 2342 cubic inches and is $10\frac{1}{2}$ by $11\frac{1}{2}$ by $19\frac{1}{2}$ inches. The dimensions given in each case are inside measurements.

Box Material. The standard size material for the sides of the apple box is three-eighths inch, one-fourth inch for the top and bottom, and three-fourths inch for the ends. There are also some veneer materials sold for the ends of boxes. The chief objection to this material is that it will warp and not stand up under shipment. The best woods for box making are spruce and pine. For long or export shipments it is sometimes advisable to use double tops and bottoms.

The kind of material to be used is also very important. The Yakima Fruit Growers' Association buy pine material for their members.² They have found that it will not impart a disagreeable odor to the fruit and it is also very

¹ Wilkinson - The Apple, p.295.

² Lowther - Encyclopedia of Practical Horticulture, Vol. I, p.329.

durable. "Fire killed wood" is almost odorless and does not impart an undesirable flavor to the fruit.¹

For nailing the box, use cement coated nails. They will hold better than the ordinary galvanized nail and while the initial cost is a little greater, they prove less expensive in the end.

The barrel.

The United States apple grading law, known as the Sulzer Law, provides for a standard apple barrel. The dimensions are, when measured with distention of parts, length of stave 28-1/2 inches, diameter of head 17-1/8 inches, circumference of bulge 64 inches, outside measurements, representing approximately 7,056 cubic inches.

This is the first legal step towards the standardization of the apple business. There are many defects in regard to the grade and quantity but this step will undoubtedly lead to more constructive legislation, which will result in a betterment of the apple business.

Wilkinson makes the following statement: "Fastidious people do not care to place on their tables an imperfect apple, and no apple that has been placed in a barrel is perfect."² It is true that many apples, especially on the top of the barrel, are bruised, but there is a larger percentage of fruit in the center of the barrel that is perfect; the amount of course

¹ Outlook, Vol. 101, p.665- 1912.

² Wilkinson - The Apple p.292.

depends on the condition of the fruit at the time it is packed.

The barrel is and will be a standard package for the lower grades and quality of apples in Missouri for many years. The chief advantages of the barrel over other packages on the market are:

1. It is a cheap package; i.e., more apples can be packed in a barrel at less cost for the package than in any other package.

2. The cost of packing, per apple, is relatively less than in other packages.

3. The crop can be handled much faster than with the other packages.

Disadvantages of using the barrel:

1. Some fruit will be bruised and practically unsalable, as shown by Fig. 11.

2. Because of the quantity the barrel will have to be opened and the fruit repacked before it is sold to the consumer. This will increase the cost to the consumer and decrease the price that the producer will receive.

3. The barrel is not adapted to special or fancy trade and it will never be a package for the high class trade, consequently it is not a package which will enable the producer to realize the most for his fruit.

4. The fruit cannot be kept clean, and when one apple in a barrel rots, it will cause rotting of all others with which it comes in contact.

Fig. 11 Apples taken from the top of a barrel.

Note the amount of bruising which takes place when the head of the barrel is forced in; this condition cannot be avoided in barrel packing.

THE RELATION OF STORAGE TO MARKETING.

Storage has been the prime factor in the development of our present system of apple marketing. It has greatly lengthened the season in which we may obtain fresh fruit. Storage must be considered as a ware-room and not a preserving plant. The process of normal activity in ripening is greatly accelerated when the fruit is taken from the tree. The process takes place less rapidly at a low temperature. Before the advent of cold storage the apple season lasted from two to four months; with the modern use of our present system we may have fresh apples from eight to ten months of the year. Cold storage has done more than any other factor in improving our apple marketing conditions. Before this system of handling fruit was practiced, there were comparatively few commercial orchards. The fruit then was quite largely grown for home use or local market. This condition caused a glut on the markets during the picking season and shortly thereafter; during the greater portion of the year, however, there was no fruit on the market.

Types of Storage.

Local Storage. Many farmers have long been accustomed to bury fruit in the ground. While this practice has the advantage of supplying the farmer through a part of the winter, a great deal of the fruit is lost by it. To the farmer, however, such loss of fruit was not sufficient to justify discontinuing his practice. This type of storage had little influence upon the commercial distribution of the crop.

Common Storage. This type includes storage plants with natural means of temperature control. The plants are so constructed that they will maintain a fairly constant temperature for a short time. The walls are double with an air space between. The doors and ventilators are left open during the night and cold air is allowed to fill the room; these are closed during the day. This makes the temperature low enough to properly hold the fruit. Where more expensive plants are constructed a fan is installed and run by a gasoline engine, forcing the warm air out and the cold air in. This type is very satisfactory for apples during the fall and winter, though it cannot be successfully operated for storage for summer apples.

There are several of these storage plants in southern Missouri which are used very successfully. Fig. 12 shows a common storage plant at Marionville; this plant belongs to one of the most progressive orchardists in that section.

Cold Storage. The same general type of construction of the building is used as described under Common Storage. The cold storage has some artificial means of raising the temperature; there are two systems - chemical and mechanical. The temperature is regulated in the storage room by means of fans. Without these fans the cold air will settle near the floor and the warm air collect near the ceiling; this will cause the fruit near the floor to be at too low a temperature, consequently injuring it, while that near the ceiling will be at too high a temperature for proper keeping. The expense of a cold storage

Fig. 12 Common storage plant, Marionville, Mo.

plant will depend upon the size - that is, it will be more expensive per barrel to construct and maintain a plant for a few hundred barrels, than it will for several thousand. It would probably be impractical for the individual grower to build a plant for his own apples, unless he can use this plant for storing other farm products throughout the year. The cold storage plant offers a splendid opportunity for cooperation among the farmers of a given community. It can be used for apples during the fall and winter and eggs and dairy products in the spring and summer.

Factors to be Considered in Storing Fruit.

What to Store. It must be remembered that storage is not a cure-all for our marketing conditions. The operation increases the cost of handling a crop, and only the best fruit will justify this increased cost of handling. In case of a light fruit crop it may be an economical practice to use the cold storage to hold the second grade fruit for a short time, but it should never be held the full length of the storage season. In case it is, it is put in competition with first class fruit and therefore must be sold at a loss. It is never advisable to store fruit that contains insect or disease injury; such fruit has a very short storage life and will not stand the storage conditions. Imperfect specimens that have received mechanical injury during the marketing operations should not be stored.

When to Store. There has been much investigational work done by the United States Department of Agriculture

upon this problem; some of the various state experiment stations also conducted cold storage tests. The conclusion generally reached is that fruit should be stored when it reaches maturity. Some of the earlier writers on this subject were in favor of picking fruit before it was mature, for storage. Later investigations have proven that immature apples will not properly ripen, and they are more susceptible to storage troubles. Fruit that is overripe will break down much more rapidly than properly matured fruit.

All fruit that is to be placed in storage should be taken immediately after packing. A delay of a few days in placing fruit in storage will probably mean that the storage life will be shortened weeks or even months. The fruit should be allowed to cool down as much as possible before it is hauled to storage. For example, fruit that is hot when placed in storage, will take a great deal of time to cool to room temperature; the time depends upon the size and character of the package. The apples in the center of a barrel will take much longer than those on the surface of a box.

Temperature. In storing any commodity, temperature is one of the most essential factors upon which the success of the operation depends. For apples the best temperature is 32° F. The difference of one or two degrees above or below will seriously interfere with the keeping quality of the apples. In case of an accidental temperature of below 32° F. and the fruit freezes, if the temperature is gradually raised

there will be little injury done. The freezing is done in intra-cellular spaces and the water is drawn from the cells. If the temperature is slowly raised, the water will again be taken up by the cells. However, if the temperature is rapidly raised, it will cause a rupture of the cell walls thereby very materially injuring the keeping qualities.

Ventilation. The storeroom must be equipped with ample means of ventilation. It is a well known fact that cold air settles and warm air rises; this fact is taken into account in the operation of a successful storage plant. Means must be provided for a constant circulation of air. If this is not done, the temperature near the floor and cooling system will probably fall below the freezing point, while in other portions of the room it will be too high to secure favorable results.

Fungous Diseases in Storage. If the fruit has been properly handled before it is placed in storage, there will be little trouble from this source. Over-ripe fruit is more susceptible to disease than properly matured fruit. The principal storage diseases are apple scab (Fusicladium dentricum), pink mold (Cephalothecium roseum), blue mold (Penicillium glaucrum, Link.), black rot (Sphearopsis malorum) and bitter rot (Gloesporium fructigenum, Bark.). These diseases develop very rapidly on the fruit that has been heated before it is placed in storage. During the warm season it is very essential that as little time as possible be consumed between picking and

storing. Since fungous diseases develop more rapidly at a high temperature, it is essential to keep the fruit at the minimum temperature which it will endure. Fortunately the apple demands a lower temperature than is favorable to the development of fungi.

Handling the Fruit After it Leaves the Storage.

It is a general conception of the average person that any commodity that has been in storage is lacking in quality upon removal. This is not true in most cases. Cold storage, if properly managed, will not alter the quality of the fruit. If apples are properly matured at the time they are placed in storage, there will be little difference in their quality at the time of their removal. It is also the general opinion of the layman that if apples have been in storage, they will deteriorate more rapidly upon removal than would be the case had they not been held at such a low temperature. This is also unfounded by investigation upon this point. It is true that at the time apples are removed from storage they are reaching the end of their normal life, and will not stand as high a temperature as they did before being placed in storage, due to this over-ripe condition. Apples should be kept at as low a temperature as possible upon being removed from storage. The following table shows the results of a test made by Madison Cooper.¹

¹

Cooper's Practical Cold Storage, 2nd ed., p.370.

Amount of Decay After Removal From Storage
at Different Temperatures.

Variety	Date removed	Date inspected	Percentage of rot			
			44° F	48° F	61° F	67° F.
	1903	1903				
Baldwin	Jan. 29	Jan. 29	0	0	0	3
	" "	Feb. 10	0	0	3	10
	" "	" 13	0	0	12	14
	" "	" 16	0	0	21	24
	" "	" 20	0	4	23	28
	" "	Mar. 3	5	10	--	--
	" "	" 7	5	15	--	--
	" "	" 24	20	--	--	--
	" "	Apr. 6	36	---	--	--

This table shows very conclusively that fruit upon removal from storage should be kept at as low a temperature as possible. If a dealer handles apples that have been in storage, he must be equipped to provide cold storage for them upon removal, or else buy a very small quantity at a time.

Storage Scald. There has been much object raised to storage fruit on account of this trouble which is due to a physiological break-down and is not caused by fungi or bacteria. The amount of scald will depend largely upon the variety. As a rule the green colored varieties will scald worse than the more highly colored ones. It is very essential to keep fruit at a low temperature in order to prevent this scald. The following table from Cooper's Practical Cold Storage (p.377) shows the

effect of different temperatures on the amount of scald after the fruit has been removed from storage.

Variety	Date removed 1903	Date inspected 1903	Percentage of scald			
			44° F.	48° F.	61° F.	67° F.
Baldwin	Jan. 29	Jan. 29	0	0	0	0
	" "	Feb. 3	0	6	21	22
	" "	" 4	4	11	21	37
	" "	" 6	4	25	40	63
	" "	" 7	4	25	41	63

It should be borne in mind that fruit that is to be removed from storage should be handled as carefully as possible to prevent rapid deterioration and scald.

The Advantage of Wrapping Fruit for Storage.

As has been previously mentioned all Extra Fancy and Fancy fruit should be wrapped. The following table shows the advantage of wrapping fruit, by the amount of decayed fruit in storage.¹

Amount of Decayed Fruit in Bushel Packages, April 29th.

Variety	News- paper wrapped	Un- wrapped	Variety	News- paper wrapped	Un- wrapped
Baker	3.7	27.2	Northern Spy	5.6	52.0
Dickerson	6.4	43.0	Wagener	38.0	63.0
McIntosh	7.7	15.0	Wealthy	42.0	68.0
McIntosh	19.7	32			

¹ Cooper - Practical Cold Storage.

In every case, as shown by the preceding table, unwrapped fruit decayed more than did the wrapped fruit. In boxed apples it is very important that they be wrapped before placing in storage. It is also interesting to note the way the different varieties keep in storage. There seems to be little difference in the kind of paper used for wrapping as it affects the keeping qualities. The other objects of wrapping fruit have been previously discussed in this paper.

Responsibility of the Manager.

The manager of a cold storage plant is not responsible for the keeping qualities of apples placed in his care. He is responsible, however, to see that a constant temperature is maintained at all times and that the storage is properly ventilated. The owner of the fruit must stand the loss due to decay, scald or any other external injury. Storage companies are seldom dealers in the product which they have in their warerooms. For the fulfillment of their requirements, they charge a fixed fee for handling the apples.

THE VALUE OF ADVERTISING IN DISTRIBUTION.

Agriculture is the only industry of importance that does not carry on a systematic advertising campaign. There has been some effort on the part of the apple growers to start a campaign to increase the consumption of apples in general, but this has not as yet developed. Some districts do advertise in a limited way, but as a whole the apple industry

is unadvertised. The apple growers should follow the lead of the citrus growers in regard to this matter. The substitute fruit products for fresh fruit are constantly advertised, and in order that the apple receive its proper place as a food commodity, it should be constantly before the people in printer's ink. There is no organized effort, so far as the writer has been able to ascertain, where the growers of Missouri are helping to advertise this important food product. The grower leaves the advertising of the apple to the wholesaler and retailer. It would be the same principle if the manufacturer of a certain breakfast food, for example, should leave the advertising of his particular product to the wholesaler and retailer.

An advertising campaign cannot be financed by one individual grower, but it requires the combined effort, of all the growers, in all apple producing sections, to greatly increase the apple consumption; also this should not be so general a project that the individuality of each section would be lost in such a scheme. There will be enough different qualities of fruit in each section, that each will meet with special favor on some markets. The point which primarily interests the apple grower is to increase the consumption, thereby increasing the demand for apples. If the demand is increased, it will increase his profits from his plantings. In order that advertising may be successfully carried on, it is essential that the growers be organized, since organized

work within a section will lead more rapidly to general organization than if each man is trying to meet the demand individually.

The citrus organizations of California and Florida carry on systematic advertising campaigns. The campaigns carried on by the California Fruit Exchange are financed through the Exchange by each grower paying his part. Their advertisements appear in practically all of the leading periodicals in this country. The consumer who reads these advertisements will demand that he get "Sunkist" when he is buying oranges. To help defray the expense of advertising, the California Fruit Exchange offers to send, prepaid, for each one dozen Sunkist wrappers sent to their head office, together with 12¢ in stamps, a sterling silver spoon. These spoons cost the Exchange about 10¢ each; they have been able to get this price on account of buying in large quantities. The other two cents cover the cost of postage. In this day of coupons and trading stamps, the average housewife will buy the "Sunkist" oranges in preference to other fruit in order that she may get a premium. Also by this method the Exchange breaks even on the transaction, their only expense being that of newspaper advertisements.

Another important factor that must be considered is the establishment of a brand. This should include a name for all apples produced in a given section; for example, for South Missouri there should be the "Ozark Extra Fancy" brand; this would include apples of extra fancy grade. "Ozark Fancy"

would be second grade; "Ozark Choice," third grade. Such a scheme would enable the consumer to know immediately what he would receive if he bought a box of Ozark Extra Fancy. After the trade mark has been established, it should be used in every possible way to get the product before the people.

The individual grower can, in a limited way, create a demand for his product by establishing a brand for a local market. In this way he can build up a special trade and sell fancy fruit. One South Missouri grower has been very successful in advertising his fruit in a special box, which he sells as "Ozark Beauties." He has found that he cannot supply the demand that is created for this particular grade of fruit.

Another very successful orchardist in Southern Missouri has adopted a rather unique system of advertising his barrelled apples. Fig. 13 shows his method. The "Red Hoop" are extra fancy; the "Red Stave" are orchard run. The dealers on the market realize that these barrels are as represented, and know they will be as guaranteed. The grower is a business man who will adjust claims made against his fruit. By this system, which is inexpensive, he has been able to create a demand for his apples at prices above the average for the market on which they are sold. It is something different and attractive.

There are many other instances that could be cited where, by a little trouble and expense, the grower has

Fig. 13 Distinctive brands or trade marks, such as "Green Hoop" or "Red Stave" are an advantage in better marketing.

POSSIBLE CHANNELS THROUGH WHICH APPLES MAY
PASS FROM PRODUCER TO CONSUMER.

Fig. 14 Chart showing market agents from
producer to consumer.

been able to sell his fruit at an added price. The fact that advertising pays in other lines of business proves that it will pay in the apple business.

DISTRIBUTION OF APPLES.

The previous discussion has dealt with the ways in which the producer may improve his apples for the market. There are also many ways in which the fruit may ultimately reach the consumer. The chart on the following page, adapted from United States Department of Agriculture Bulletin No. 267 shows the various members that comprise the market staff. The apples may pass through any combination or all of these channels, or directly from the producer to the consumer. Some marketmen are very essential in distribution, each firm assisting in some way toward the solution of this important problem. The cost is increased by each firm that handles the fruit; the most complex route will be the most expensive under ordinary conditions. Oftentimes, however, one firm will add an unusually high per cent for handling. The average producer looks upon commercial dealers in the market as useless usurpers of profit, and rarely realizes that without the market staff he would be helpless. It is true there are many unjust practices followed by commission men. These should be looked upon as individual cases and not as a part of the marketing system. There are men in every trade who will take advantage of another when opportunity is presented. Do not condemn the vast army of marketmen because a few members practice unfair methods. The

organization is fairly well worked out on an efficiency basis. The smaller shippers, as a rule, are the ones that complain most about the market conditions. The man who ships from one to ten cars each season rarely realizes that the consignor may handle more apples each day than he will handle in years; he does not know how to prepare shipments so they will receive the best attention on the market. Many times the consignee is as much at fault as is the consignor. The shipper oftentimes wires the market man, asking for prices on a car load of extra fancy apples. Upon receipt of the quotation he ships his apples feeling reasonably sure that he will receive the price quoted. In many cases, however, the apples shipped are only fancy or "C" grade, and the price will be correspondingly lower. This creates a condition that is very hard to adjust. If there were standard grades, it would better enable both the consignee and consignor to reach a definite agreement. It would also facilitate direct handling, if, sometime during the distributing season, the shipper could spend a day or two on the markets and actually observe conditions in which his fruit arrives. This would enable him to better appreciate any claims that would be made against him.

In many cases commission men are at fault. It is not the aim of the writer to justify all the acts of the trade. In correspondence last season (1915) a Missouri grower stated that he had shipped two car loads of apples to a commis-

sion firm in St. Louis. At the time he wrote, three weeks later, he had not heard from the firm as to whether or not they had made a sale, received the fruit or anything about it. He knew nothing of their financial standing or their reputation as a selling firm. Under such conditions, the seller will usually not only lose his fruit, but in many cases also have to pay the freight on the shipment. While the commission firm in this case was partially at fault, the grower was as much at fault by his slipshod method of doing business. Such a case does not condemn the commission business; the firm probably was not known even locally among the leading firms.

Producer Direct to Consumer.

To the idealist all farm products should pass directly from the producer to the consumer without passing through the hands of middlemen, thereby adding extra expense. This system of marketing is not practical except in rare cases. To a large degree the country towns are supplied with apples direct from the producer. Here the producer does the work of the huckster. The chief objection to this system of marketing is that the grower does not take time to properly prepare his apples for the market before he delivers them to the consumer. These apples are usually inferior in grade and have been injured through rough handling, so the fruit is expensive at any price.

Parcel Post.

There has been much agitation in the last few

years concerning marketing by parcel post. This has, to some extent, aided in the solution of direct marketing. In Missouri there are few growers adjacent to the principal cities who have established a market for their apples by parcel post. In all cases the men that have made a success of this, have been very progressive, and have had the business ability to handle such a proposition. There is too limited a demand in St. Louis and Kansas City for the progressive growers to build up a very profitable business by this method. It must be remembered, however, parcel post is the most expensive system of marketing. It requires personal correspondence in building up a trade, and necessitates keeping in close touch with the consumers after the business connection has been established. Packages and packing cost more for the amount of fruit sold than is the case by other methods; parcel post rates are high, especially when you consider marketing a very bulky package. It is hard to adjust differences and secure payments under this system. The producer usually wants his money in advance; the consumer wants to see the fruit before he pays for it. This involves a system of bookkeeping, and there will be some accounts that cannot be collected. In general, marketing by parcel post will have little effect on the apple situation in Missouri.

Parcel post marketing demands only the very best grade of high quality apples. The following table gives a list of the leading varieties in Missouri together with their

acreage.¹

<u>Variety</u>	<u>Acreage</u>
Ben Davis	51,528
Jonathan	10,441
Gano	6,354
Winesap	3,516
Missouri Pippin	1,366
York	1,439
Ingram	1,306
Grimes	1,134

The above data shows that about 80 per cent of Missouri apples are medium to low in quality, and that only two varieties give in the above list - Jonathan and Grimes - are worthy of parcel post marketing. There are a few other varieties grown in limited amounts, such as Delicious, Stayman Winesap and McIntosh, that would probably justify parcel post shipments in case the demand could be created for them.

Sale on Trees.

Many Missouri apples are sold on the trees to local or travelling buyers. This type of sale requires the buyer to visit the orchard; he usually makes a lump offer for the entire crop, takes all the fruit and bears the expense of harvesting. The grower receives cash for the apples at the time they are picked. In case of freeze or other injury to

¹ Mo. State Board of Horticulture Annual Report 1913.

the fruit after the sale has been made, the loss is borne by the buyer.

The chief disadvantage, to the producer, of this method is, the buyer is usually a better judge of the amount and value of fruit in the orchard. The price is usually made on an estimate basis of so much per bushel. Last season (1915) a buyer visited a Pike County orchardist, making him an offer of \$800 cash for his apples on the tree. An estimate was made and the buyer convinced the grower that he was receiving about a dollar per barrel on the tree. When the apples were packed, the buyer had 3600 barrels of orchard run fruit, together with the culls, making the price the grower actually received about 45¢ per barrel. This is another reason why Missouri apple growers must adopt better business methods, if they would secure more remunerative returns.

The practice of selling on the tree should be discouraged. The buyer does not care how much injury is done to the tree while picking the fruit; it is to his interest to have the pickers gather the fruit as fast as possible. The grower should in all cases reserve the right to at least superintend the work of picking.

Selling on the Packing Table.

In many Missouri orchards this method is practiced. The grower sells at a given price per package on the table. This enables him to have supervision of the pickers, while the buyer has the advantage of grading the fruit. This

system has proven very satisfactory where extensive buyers can be attracted to an orchard and a sale made at a price justifying the transaction. However, this method of selling should be discouraged if the apples are to net greatest returns to the grower. If the grower is capable of managing the laborers and can properly pick, pack and make his own sales, eliminating the travelling or local buyer, he can realize greater returns. The chief advantage of selling in the packing house is that the grower gets cash for his apples at the time they are delivered; also he has little harvesting expense.

Selling at the Car.

Car sales are very often made, especially in Southern Missouri. The grower picks, grades, packs and delivers the fruit at the station on cars. Much can be said in favor of this method in case the grower has sufficient labor to properly do the work. It allows him to control his apples through the entire growing and harvesting season. As a rule, the grower can harvest the crop cheaper than the buyer. He usually contracts with labor for so much per month or day, while a buyer ordinarily pays regular harvest wages. In case car sales can be made, it is better to make them than it is for the average grower to ship with the expectation of making better sales on the market. In some cases, however, the grower must ship in order to get a price that will justify him for producing apples.

The Value of a Co-operative Association as a Market Agent.

In all districts of the United States where fruit growing has been developed to a high degree of efficiency, organized marketing is practiced. There is no other agent as effective in distribution that can handle apples as efficiently. Missouri apple growers have not realized the true value of co-operative associations in marketing.

Such an association in Missouri would undoubtedly prove as great a factor in distribution as it has in other sections. A co-operative association presents many advantages other than marketing, yet this is the only one discussed in this paper. A well organized association has a definite set of grading and packing rules that must be adhered to by each member, thus standardizing the product. A lack of standardization of packing utensils and grades is the most serious drawback to successful marketing of Missouri apples.

A co-operative association acts as a sales agent, which is its most obvious value. Better sales can be made by the manager than by the individual grower; the former devotes his entire time to the problem of distribution, in locating markets, adjusting claims with the railroads, establishing new markets, obtaining market information by wire and advertising. The volume of business handled by the association demands more consideration than the shipments by the individual grower. Buyers will cater to them for their business and will handle on a smaller margin of profit, since they are sure that the apples

will be standardized. The volume of business also enables this agent to handle apples for the growers on a lower commission.

The success of such an association in Missouri cannot be predicted, but it is reasonably certain that, sooner or later, we will be forced to practice organized marketing. There is not other way in which the growers can get best results from the apple business. Marketing agents will co-operate with the growers as soon as they see it is to their interest to do so. A recent investigation in the northwest, made by the United States Department of Agriculture, Office of Rural Organization and Markets, shows the growers and marketing agents have given the Government agents every possible aid in the way of available data as to their methods, hoping a better system can be evolved, securing better results for all concerned. Such co-operation would be impossible in Missouri at this time. If Missouri growers were organized and had their products properly standardized, the demand for apples from outside the state would be materially lessened.

Let us get together on the method that will mean most to the growers individually, and to the apple business of Missouri. By a united effort upon the part of the growers of Missouri we can secure the aid of the Government agents, as did the growers of the northwest, who will help us solve our marketing problems.

The Auction.

The auction market is maintained in several of our larger cities for the distribution of apples and other fruits. The fruit is usually consigned to market agents, who represent the shipper and are responsible for the proper display of the fruit by the auction company. Auction companies usually prefer this system to that of direct consignment, since it prevents dissatisfaction; the shipper also will have a representative whose duties are to arbitrate and settle any claims. The auction company each morning displays the fruit and issues a catalog of the day's offerings. The offerings are usually of relatively small quantities and the description contains the necessary information regarding size, quality and other details. Before the auction opens the buyer is given a catalog and allowed to examine the fruit, making such notations as are necessary that he may know the particular lot of fruit he wants.

At a regular hour each morning the sale opens, at which time the buyers are grouped together around the auctioneer's stand and the apples are sold very rapidly. The buyer does not have time to re-inspect a given lot of fruit. The price received for fruit on the auction market will depend upon the amount offered that day. If there is a shortage of a given variety of apples, for instance, that variety will move very rapidly and at a fancy price. In case of a glut on the auction market the fruit is sold at a very low figure. The principal advantages of the auction market are that the fruit

is sold for cash and that the auction company is interested in obtaining as high a price as possible in order that they may continue to handle fruit for their shippers. The disadvantages are that in case of a glut on the market and a few buyers meet and fix the price that they will pay for a given lot of fruit. The auction also adds another expense to the distribution. This includes cost of displaying, issuing catalogs and the actual cost of making the sale. The average auction cost to the shipper is from 3 to 12 per cent.

At the present time Missouri growers do not use the auction to a very great extent, the chief reason being they do not have the character of fruit the auction demands. To secure best results from this market the fruit must be carefully graded and neatly packed. Bulk fruit cannot be sold profitably through the auction.

The Broker.

The broker is an agent whose duties are to arbitrate between the producer and the trade. He usually has apples consigned him for which he will find a market. It is not the function of the broker to buy apples that are consigned to him, but to keep informed with reference to markets and to sell to the wholesaler, commission merchant or jobber. The brokerage fee is usually small, because he is not responsible for loss that may occur to the consignor. If there are any men on the marketing staff who can be eliminated, they are probably the brokers. In many cases, however, the broker obtains

a better price for the individual grower than he could receive shipping directly to other market men. The broker is or should be responsible business man and should give adequate assurance for faithful fulfillment of his duties.

(The following contract, which, however, deals with peaches instead of apples, is typical of the broker's business.

This contract was made with peach growers in a given section who had between 450 and 500 acres. The broker agreed to find a market for all the crop; the growers were bound by a written agreement to let him sell all the fruit, except that sold locally. For his services he was to receive 5¢ for each Georgia Carrier, 6¢ for each bushel basket, and 3¢ for each one-half bushel that he sold on track or delivered. The broker also had a contract with commission merchants on the market who paid him 2 per cent for all fruit shipped on consignment; he received from the growers 1 per cent for all fruit he shipped on consignment. He was to send only to firms that charged 10 per cent or less.

It will be seen that the broker had a deal that would net him a large sum for "finding" the market. With him there was nothing to lose. This work could be done much cheaper and more efficiently by a co-operative organization.

The Wholesaler.

The wholesale dealer buys direct from any of the above named agents or the producer, buying in large quantities

and usually on a cash basis. The sales are made "to arrive" or "delivered", and the apples are bought according to the grade, assuming that they will arrive in first class condition. In case the condition of the fruit is below that specified, the shipper stands the loss, but after the wholesaler receives the fruit he is responsible for it. This risk causes the wholesaler to handle the fruit on a very wide margin; this margin will vary from 25 to 100 per cent, depending upon the grade, the better grades bringing the higher prices. The dealer can well afford to handle properly packed apples cheaper than he can in bulk, due to a sure loss of a portion of the latter. The wholesaler divides up the shipments into smaller lots to sell to the retailer.

The wholesale dealer is one of the more important of the market men for the producer. The latter can assemble the apples into large quantities, thereby getting better freight service at a lower cost, also receiving cash for his apples. The wholesale trade is, in the main, fairly free from objectionable practices, since the fruit is purchased outright and there is little chance for squabbles over the deal. The grower also receives his money before the fruit is finally delivered to the wholesaler. In all shipments made by the grower who has no personal representative on the market, instructions should be given to the receiving railroad agent to allow inspection without surrendering the bill of lading; yet when the sale is actually made, the grower can advise the agent

by wire to deliver the car of fruit to the wholesaler.

The Commission Merchant.

The commission merchant, who is also very often a wholesale dealer, is probably the most abused of any member of the market staff. The practice of acting as a commission merchant and a wholesale dealer at the same time has induced much criticism and in some cases this is apparently justifiable. This practice of the commission merchant doing wholesale business is at the present time being discouraged by the leading dealers. Such men have usually proven to be speculators who have all to gain and nothing to lose. If the price is advancing, they buy; if declining, they sell on commission. So long as such men are allowed to engage in this business there will be much dissatisfaction among the growers.

The commission man, however, does perform an important mission. He solicits sales for apples consigned to him and it is to his interest to make the sales as high as possible; the higher the sale, the higher the commission. In Missouri a large per cent of the apples are marketed through this channel. In most cases the growers receive fairly prompt and satisfactory returns. In all cases the grower should determine the responsibility of the man or firm to whom the consignment is made. If this practice were followed much loss and dissatisfaction to the growers and shippers would be eliminated.

The commission charged for handling depends upon

the condition of the fruit when it reaches the market. Well standardized apples are handled for about 10 per cent, while the commission for handling bulk shipments is often as high as 50 per cent.

The Retail Merchant.

By this term is usually implied the grocer or some other small dealer who handles enough apples to supply the demand of his customers. He generally sells to make as large a profit as possible on a small quantity of fruit and thus avoid handling a large amount on a small margin. The retail merchant does not, as a rule, attempt to increase the sale of apples. Retail business done on credit adds to the selling price, since some consumers are slow pay and others will not pay at all. In Missouri the average apple offered for sale by the retail store is inferior in character; this is due to the fact that it is impossible to obtain first class, locally grown fruit.)

The retail merchant buys his apples usually in small quantities at a fairly high price, and because of its perishable nature he sells at an increased price, adding to the cost the proportionate part of the running expense of the business. (There are many apples in Missouri that reach the consumer through this very complex and expensive channel.

The Fruit Stand.

These dealers do not, as a rule, attempt the sale of large quantities of apples, but usually try to sell in small quantities for a high price, each apple paying a 100 to 250 per

cent profit.) (While there are many apples sold in Missouri from fruit stands, they are usually out-of-the-state shipments.

As shown by a recent investigation made by the writer, more than 75 per cent of the apples offered for sale on Missouri fancy markets are introduced from the Northwest. This investigation included leading hotels, fruit stands and news service. The following letter is typical and explains why this is true.

"I would like to add with reference to your question as to whether our demand could be filled with Missouri apples that, with the exception of Jonathans, we can get no first class and attractive table or display apple in the state of Missouri. We are of course aware that there are several varieties of fine flavored eating apples raised in Missouri, but they suffer so much in comparison with northwestern apples that we do not handle them, outside Jonathans. Then again, Missouri producers do not pack their boxes in the same attractive way of the producers of the northwest. We use a large quantity of Missouri Ben Davis apples for cooking purposes only."

This letter was signed by the manager of one of the largest firms in Missouri handling fancy fruit. His firm distributes annually more than 26,000 boxes of extra fancy fruit. This letter also shows the price they were paying for apples November 16th, was approximately twice the amount Missouri grown fruit was bringing on the same market.

A Kansas City commission man told the writer he

would prefer to handle Missouri Jonathan over any other apple, if he could secure fruit of the character his trade demands. He also stated retailers prefer quality over color, provided the fruit is properly graded and packed.)

The Huckster.

The huckster is a cash dealer who buys in relatively small quantities and does not have his money tied up in the business for more than a few hours. Much can be said in favor of this dealer; he makes a house to house canvas and disposes of large quantities of apples at a fairly low price. He is usually a man who does not demand a high price for his own labor and his operating expense is very low. It is to his interest to increase the demand for apples. The huckster will handle any grade of apples desired in any section of the city in which he works. (There are many Missouri apples disposed of through this source, in spite of the fact that it is the cheapest and oftentimes the most unsatisfactory of the retail methods.

CONSERVATION OF BY-PRODUCTS.

Proper handling of the cull apples will in some cases mean the difference between profit and loss on the season's operation. The grower must learn to realize that culls do not include mean, wormy or badly diseased fruit, yet do include the well matured, small sizes and those showing physical defects. The grower may carefully handle his crop of apples through the entire season and profitably market those that can go on the market as graded fruit, yet if he waste his culls he may lose,

in many cases, a high per cent of the returns. If he realizes every dollar secured from culls is profit, he would take more care of this class of goods. According to estimates made by writers, 25 to 40 per cent of each apple crop rots in the cull pile. This per cent is probably highest in Missouri.

There are several ways in which the by-products of apples may be marketed, the most important of which are as follows:

1. Culls marketed as such.
2. Cider vinegar.
3. Evaporation.

The system that should be followed in each community will depend largely on the local conditions. For example, in regions where very few apples are grown, the culls will sell for as much as received for fancy fruit in the leading fruit producing sections. Under such conditions the sale of culls would be justifiable. The culls should always be handled as cheaply as possible; it will not be practical to pack them. They should be sold as soon as possible to avoid competition of the best grades later in the season. Culls will not keep as long as the graded fruit.

Cider Vinegar.

This is one of the chief methods of utilizing culls to the advantage of the grower. There is a constant and keen demand for first class cider vinegar, since much of the vinegar sold on the market is largely a substitute article.

Artificial apple vinegar is not of as high quality as genuine apple vinegar, yet it is consumed more largely for several reasons:

1. It is cheaper.
2. It is more carefully handled and is a cleaner, more sanitary, uniform product.
3. Cider vinegar is not always a highly flavored product.

The cheaper artificial product has a greater demand because the housewife is sure that when she buys it, it can all be used. It has a uniform percentage of acetic acid, while the cider vinegar, if made of poor apples, will have a low acid content.

Selection of Apples for Vinegar. The selection of varieties of apples for making the best vinegar is an important question. There is a difference in varieties and, generally speaking, the one containing the highest per cent of sugar makes the best vinegar. This does not necessarily mean the sweetest apples, since the lack of acid and not the large quantity of sugar makes an apple sweet.

The following table, as given by L. L. Van Slyke, in Geneva Bulletin No. 258, shows the composition of apples.

Analyses of Juice
of Different Varieties of American Apples.

Variety of Apple	Specific Gravity	Solids %	Equivalent of Total Sugar in Form of Invert Sugar %	Fixed Acid as Malic %
Baldwin	1.072	16.82	15.39	.67
Belleflower	1.061	14.09	12.82	.58
Ben Davis	1.052	12.77	10.60	.46
Ben Davis	1.046	10.69	6.74	.44
Gano	1.046	10.16	8.61	.41
Gano	1.056	13.92	11.32	.41
Grimes Golden	1.070	18.18	14.05	.74
Jonathan	1.056	14.62	11.60	.32
Maiden Blush	1.051	12.70	9.99	.67
Northern Spy	1.052	13.77	9.77	.69
Red Siberian Crab	1.070	17.34	11.83	.97
Rome Beauty	1.048	11.37	8.70	.37
Wealthy	1.057	15.26	11.64	.66
Whitney	1.060	14.16	11.39	.40
Winesap	1.065	16.45	13.34	.58
Yellow Transparent	1.049	11.71	9.76	.87

It will be seen from the above table that apples have a wide variation in the per cent of sugar. There has been a great deal of complaint among Missouri growers that they could not make salable vinegar from Ben Davis apples. The

table shows why this is true; vinegar can be made from Ben Davis apples, if the fruit and cider are both properly handled.

The following table shows the sugar content of the same variety - Baldwin - at the different stages of ripeness.

Sugar in Baldwin Apple at Different Periods.

Date	Condition	Equivalent of Total Sugar in Form of Invert Sugar %
August 7, 1899	Very green	8.11
September 13, 1899	Green	10.72
November 15, 1899	Ripe	14.87
December 15, 1899	Over-ripe	14.85

The above table indicates that ripe apples are the best for vinegar making, since the higher the sugar content, the higher the acid content. The culls should be allowed to ripen before they are made into cider or vinegar.

Method of Making Vinegar. Few Missouri orchard-ists understand the process of vinegar making. They use dirty, rotten, wormy apples, believing they will not influence and cannot be detected in cider or vinegar. This practice produces a mixture that is dreggy and muddy, and may fail to form vinegar. The apples used for vinegar should be washed, carefully culled, and rotten parts discarded. This will make a remarkable difference in the character of the vinegar. Another very common fault is the use of poor containers. The old custom of putting sweet cider into the old vinegar barrel should at

once be discontinued. In case it is necessary to use a barrel that has previously been used for vinegar, thoroughly wash it and then sterilize with boiling water. This is necessary since other than acetic acid may be present which, if allowed to work in the sweet cider, will neutralize the sugar (glucose, $C_6 H_{12} O_6$) and prevent the yeast (zymase) from forming alcohol ($2C_2H_5OH$), and carbon dioxide ($2CO_2$).

Another common practice is to put "mother" in sweet cider. This is also a very poor method, for the reasons given above. It may in addition contain many different forms of plant life that will delay or prevent the production of the alcohol from the sugars.

The best container for sweet cider is a whiskey or brandy barrel. These are usually free from detrimental varieties of bacteria and other forms of plant life. If these are not available, use the ones mentioned and sterilize as discussed above.

The barrel should be filled from two-thirds to three-fourths full, the bung hole left open or a cotton plug put in; this is to allow yeast to "work", breaking down the glucose and inducing a change to alcohol and carbon dioxide.

To the sweet cider is added a pure culture of yeast media. This is the first step in the transformation of cider into vinegar; it is allowed to act for about a month to six weeks. The time required for this transformation varies with the temperature and the use of yeast. Experiments conducted by the

Colorado Experiment Station¹ show that cider, to which yeast was added and held at 70° F. for one month, contains 7.25 per cent alcohol, as compared with .11 per cent where the temperature was 45° to 55° F. with no yeast. Temperature alone is important. They show cider exposed at 70° F. for three months contained 6.41 per cent of alcohol, while another lot held at 45 to 55° F. required seven months to develop 6.79 per cent of alcohol.

The next step is converting alcohol into acetic acid. The process is similar to the above except oxidase is used in place of yeast.

The clear alcoholic solution is decanted and the sediment discarded. To this is added oxidase (acetic acid germs). The pure culture of oxidase is as important as the addition of yeast. Experimental data² shows a high temperature also aids in the formation of this process. One lot of hard cider, where no acetic acid bacteria were added, held at 65° F., at the end of six months contained 7.03 per cent acetic acid; another lot held at 55° F. showed only 3.63 per cent.

The practice when the acetic acid has reached 4.5 to 5 per cent is to fill the barrel and plug it tight. This checks the action of the acetic acid bacteria which are aerobic, and also prevents the work of any other organism which may deteriorate the quality of the vinegar.

¹ & ² Bul. 192, Colo. Exp. Sta.

Evaporated Apples.

There is a steady and growing demand for evaporated fruits in both this and European countries. This is a class of trade that cannot afford to buy the fancy box apples, yet can and are anxious to buy "dried" apples.

The cull pile affords a fine place to get the fruit for this purpose. The fruit must be properly cleaned and diseased parts cut out.

The equipment for evaporating fruit is too expensive for the individual grower to establish a plant on his place, but with organization a plant can be installed and this product can be handled for a community. This will give a profitable outlet for the cull fruit of a community.

SUMMARY.

1. Poor methods of distribution, and not over-production, are the indirect causes for the destruction of many Missouri orchards.

2. Missouri growers must realize that success of apple growing as a business is only possible when proper methods of production and distribution are practiced.

3. Unless apples are properly grown, they are not suitable for marketing.

4. Due to an ever increasing competition each year by other fruit, the inferior grades of apples are in less demand.

5. In starting a young orchard the operator must select varieties that are adapted to the local soil, and meet market conditions.

6. Missouri growers will eventually be forced to adopt the best known methods of orchard management. The sooner these important operations are generally practiced, the greater in importance will apple growing become.

7. Fruit is a living organism and must be treated as such in all handling operations. It is not possible to market, profitably, apples that have been bruised.

8. The lack of standardization in grading and packing is the most serious drawback in marketing Missouri

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