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MINOR THESIS

FACTORS INFLUENCING THE KEEPINGQUAL-
ITY OF FRUIT.

BY

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PREFACE.

Perhaps there is no subject that is of any more importance to the fruit growers than that pertaining to ~~in~~ the keeping qualities. It is a subject that is of interest more or less in all portions of the country. Useful experiments have been carried out along this line by experiment stations and private firms that have brought to light ways in which to prolong the marketing season and thus conducing to a better distribution of the product, as well as by indicating some of the risks that ~~are~~ are involved in the attempts to hold such products longer than their physical characteristics will permit.

So in presenting this to the faculty as my minor thesis for a masters degree, I feel satisfied that it is a subject that cannot be studied any too much for there is much to be learned that will be new and valuable to us all, not only from the commercial standpoint but from the pleasure side as well. In my experiment with apples and pears that I have been carrying on this winter, a good many valuable points have been brought to light that had never come under my personal observation before. Yet I regret very much to say that one-half of the experiment had to be entirely discarded in the early winter on the account of the cold storage room not

being completed. So I had to depend entirely on the fruit in the cellar for the results obtained. However, I have reviewed the work of a good many experimenters along this line in order to collect as much information as possible concerning the effects of cold storage on fruit.

CHAPTER, I

INTRODUCTION.

Fruit culture has come to such a point in the United States that the harvesting, marketing and general disposition of the crop have become matters of national importance. A general failure of the crop of apples, let it be from the cultural or storage effects, results in serious disturbance of commercial conditions in many important agricultural regions and involves heavy losses to mercantile and transportation interests as well as to the growers and consumers. It inflicts a hardship upon the consumers by depriving them of the most useful fruit that is brought into the household.

Next to crop failure and the control of injurious insects and diseases, the most important feature connected with fruit growing at this time is the preservation of the crop for sufficient time to allow its distribution to consumers in sound and marketable condition. This feature has become very important since the growing of the fruit has developed on a large scale in the middle and southern states where the climatic conditions are not such at the time of harvesting as to allow a very long living and commercial period for the

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fruit. Under the effects of the hot weather a large portion of the fruit is thrown upon the market in the early fall in the last stages of its life and this results in a supply that is greater than the demand in the beginning of the season and very low prices. This would be followed later by a scarcity of fruit and abnormally high prices.

The successful keeping of apples and pears on a large scale in refrigerated storage, which began about 1890, was hailed by the growers and dealers as a solution to the problem and the practice of keeping the fruit this way has since been carried on to a very great extent. Experience has demonstrated, however, that in many instances fruit stored in such houses in the fall has failed to come out in good condition in the late winter or spring, thereby resulting in a serious loss to the owner. Also it has been known for a long time that different lots of fruit in the same storage room behave differently. Some keeping in excellent condition while others spoil.

The storage of small fruits is a problem somewhat different from the storage of the large and more durable fruits. Winter apples and pears are usually too hard and immature when first harvested and stored for immediate use. Cold storage insures good keeping of these

for long periods until the proper flavor and quality has been brought out. The fruits ripen slowly in the lower temperature which is one of the secrets of long keeping and production of good quality. In the storage of small fruits the conditions and purposes are different. The strawberry, for example, is usually in its prime when picked and then in its best condition for table use. The quality is not improved by further ripening and the quicker the fruit can be consumed the better. All that can be hoped for in such a case is to hold, for a short while longer, the appearance and flavor of the fruit.

In commercial practice, small fruits are sometimes stored for speculative purposes. The fruit is bought when the prices are low, kept in cold storage until the prices advance and then sold at a profit. But owing to the delicate and perishable nature of the fruit this practice must be carefully carried out or else the speculator will lose in the deal. This system is now used for small fruits by many canning establishments for at the busy part of the season the fruit is often received faster than it can be cared for so it has to be put away in the cold storage room until it can be handled. So after investigating this subject it has been found that the cold storage system can be used with profit on any

of the large fruit farms and certainly it could not be discarded in none of the large commercial establishments if the best results are to be obtained.

CHAPTER? II.

INFLUENCE OF COLD STORAGE ON THE FRUIT INDUSTRY.

The application of cold temperatures to the preservations of fruitshas, without a doubt, influenced the development of fruit growing in America. When fruit had to be transported from the orchard to the market in common freight cars and boats without any artificial cooling, and when it reached its destination it had to be stored in pits, cellars or rooms of very warm temperatures, it was necessary to dispose of the whole crop at once else it would go bad on the owners or commission merchants and all profits would be lost. Even in the best of times the fruit could not be kept in good condition very long and to put it all on the market at once would run the prices low and at the same time it would all be used up at once leaving none for the winter and early spring.. The development of the cold storage system has entirely changed this. Instead of shipping the fruit in ordinary freight cars it is carried in a special car provided for the purpose called the "Fruit refrigerator car", Other improved methods have made fruit growing possible and profitable in remote parts of the country and made the distribution of the most perishable

fruits possible. The growth of the cold storage warehouse is making the season of fresh fruits the year round. It is distributing them more uniformly throughout the season thereby causing a more steady market.

So instead of an incidental feature of the farm, the apple is now the principal crop in large sections of the country and its production, handling and marketing of the crop are becoming highly specialized forms of agriculture. In many of the large fruit growing sections the handling of the crop and the marketing of it are controlled by organizations or by fruit merchants. These organizations or merchants buy the fruit in the orchard and who, through the special development of fruit and market statistics, are better able to handle them than the grower. However, apple storage is not always profitable. It prevents the premature deterioration of the fruit, but when the picking season is unusually hot and there are delays in getting the fruit into storage, the losses are sometimes heavy. This may be caused by the fall being cool and large quantities of fruit can be kept in common storage. The markets are well supplied with this fruit and the cold storage fruit will have to be held over until in the spring and all be rushed on the market at once, in order to be ahead of the early southern fruits. But on the whole the development of

the cold storage system is proving beneficial to the fruit industry and encouraging its development over large territories.

EXTENT OF COLD STORAGE WAREHOUSE

HOUSING INDUSTRY.

Perhaps there is no one thing that has had more influence on the development of the fruit industry than that of the "Cold Storage Warehousing" and below I copy a paragraph from work done by the Department of Agriculture showing the extent of the warehouse industry.

Accurate* statistics are difficult to obtain but in 1901 it was estimated that the capacity of the cold storage houses, including meat, egg and butter storage was a 150,000,000 cubic feet of space, of which 50,000,000 cubic feet distributed in six hundred warehouses, were devoted to fruit storage. Since 1901 there has been a large increase in the number of fruit storage houses, especially in the apple growing districts, where many plants with a capacity of from five thousand to thirty thousand barrels have been erected in or near the orchards or the railroad stations.

The cold storage business has developed most extensively in large cities and in towns conveniently located for distributing the fruit later in the season to

*G. H. Powell, bulletin, 48.

domestic or foreign markets. In many cases these warehouses serve as a check to the general sale of fruit off the farms. In case the farmers storage house should not be large enough to hold his fruit, it can be transferred to the city warehouse and there stopped from going on the general market, should the prices fail to be at a suitable figure to pay the farmer to sell.

So below I give a table*showing a list of the cities and towns in which more than 75,000 barrels were stored about December the first 1902

IN COLD STORAGE.

PLACE.	NUMBER OF BARRELS.
Chicago	431,000
New York City.....	200,000
Philadelphia and vicinity	200,000
Rochester	150,000
St. Louis Mo.	120,000
Boston and vicinity	102,000
Indianapolis, Ind.	100,000
Leroy, N. Y.	100,000
Brighton, N. Y.	90,000
Lockport, N. Y.	90,000
Albion, N. Y.	86,000

* G. H Powell, bulletin 48, U. S. Dept.

On page four I stated that successful keeping of apples and pears began about the year 1890. So from the table above we can see that there was a great increase in the cold storage system during this period of twelve years especially in the large cities. This is one great proof that there is more profit in keeping fruit in cold storage than in common storage houses.

The extent of apple storage business in states in which more than 100,000 barrels were stored about December the first 1902 is shown below.

IN COLD STORAGE.

STATES.	NUMBER OF BARRELS.
New York	967,000
Illinois	524,000
Missouri	327,000
Pennsylvania	220,000
Ohio	135,000
Massachusetts	118,000
Indiana	107,000

To compare the above table and to show the falling off of the common storage methods and the great increase in the development of the cold storage methods, below I give another table showing the different states that had

most apples in common storage December the first 1902.

APPLES IN COMMON STORAGE.

STATES.	NUMBER OF BARRELS.
New York	474,000
Maine	240,000
New Hampshire	123,000
Massachusetts	100,000
Vermont	75,000

From the above tables we can see that the cold storage system had made great advancement over the common way of storage and this increase is steadily going on each year. I am sorry that I was unable to obtain later statistics to show the more recent development of the cold storage system. However we know that it is making a steady advancement each year.

FUNCTIONS OF THE COLD STORAGE WAREHOUSE.

Time and again the question has been asked in what way the cold storage method affected the fruit in order to keep it in good condition so long. There is a good deal of misunderstanding as to the function of the warehouse and the condition leads to frequent confusions be-

tween the warehouseman and the fruit storer. Though they might be avoided and the conditions improved if there was a clearer definition on the influence of fruit preservation, of cultural methods, methods of handling and the methods of storing. The best definition that I have seen on the subject is one that is found in one of the reports of the U. S Dept.* and is as follows:

"A fruit is a living organism in which the life processes go forward more slowly in low temperatures, but do not cease even in the lowest temperatures in which the fruit may be safely stored. When the fruit naturally reaches the end of its life, it dies from old age. It may be killed prematurely by rots, usually caused by fungi which lodge on the fruit before it is packed or sometimes afterward. The cold storage house is designed to arrest the ripening processes in a temperature that will not injure the fruit in other respects and thereby to prolong its life history. It is designed also to retard the development of the diseases with which the ~~fruit~~ fruit is afflicted, but it cannot prevent the slow ~~growth~~ growth of some of them. It follows that the behavior of different apples or lots of apples in a storage room is largely dependent on their condition when they enter the room. If they are in a dissimilar condition of ri-

*S. H. Fulton

penness or have been grown or handled differently, or vary in other respects, these differences may be expected to appear as the fruit ripens slowly in the low temperature. If the fruit is already overripe, the low temperature cannot prevent its deterioration sooner than would be the case with apples of the same variety that were in a less mature condition. If the fruit has been bruised, or is covered with rot spores the low temperature may retard but cannot prevent its premature decay. If there are inherent differences in the apples due to the character of the soil, the altitude and to incidental features of orchard management, or variations due to methods of picking, packing and shipping the low temperature must not be expected to obliterate them, but rather to retard while not preventing their normal development."

In general it is the function of the cold storage house to furnish a uniform temperature of the desired degree of cold through its compartments during the storage season. The warehouses are expected to be managed in other respects so that the deterioration of the fruit or any other injury may not be reasonably attributed to a poorly constructed and installed plant, or to its negligent or improper management. The warehouseman does not insure the fruit against natural deterioration, he

holds it in storage as a trustee, and in thatn relation is bound to use only that degree of care and diligence in the management of the warehouse that a man of ordinary care and prudence would exercise under the circumstances in protecting the goods if they were his private property.

If the temperature of the storage room fluctuates unduly from the point to be maintained and causes the fruit to freeze to its injury, or to ripen with abnormal rapidity, or if the management of the rooms or the handling of the fruit in other respects can shown to have been faulty or negligent, the warehouse has failed to form its proper function.

CHAPTER, III

INFLUENCING OF THINING, GATHERING AND KEEPING.

Since the time that fruit will keep in cold storage depends largely on the conditions of it when put in the cold storage house, it might be well to devote this chapter to a few of the methods of handling and general care of the fruit, before it is carried from the farm to the warehouse. F. A. Waugh* , in his writings on the subject, considers the proper handling of the fruit on the farm and between the farm and the warehouse the one great secret in its keeping qualities afterward.

THINNING.

In order to get the best prices for our fruit, let it be apples, pears, peaches or any of them, there must be excellent qualities, a good uniform size and handsome appearance. Next to cultivation, nothing contributes more to bring out these these qualities than thinning the young fruit on the trees. If the fruit is crowded on the tree it is small, of irregular shape and color and comparatively flavorless. Overbearing also injures the vitality of the fruit and tree, hurting the tree to such an extent that the life and profitableness

*Thinning, Gathering and Marketing.

will not last near so long, yet thinning is hardly ever practiced. Crowding is injurious in any crop. The farmer for instance, would consider it a farce to leave ten or fifteen stalks of cotton, corn or potatoes in one hill. Likewise, the gardner would not leave six or ten cabbage plants or cucumber plants in one hill for they have found out that less is produced by such a method and to thin out to one or two plants far better results are obtained. Yet the same farmer or gardner never ~~thin~~ thinks to thin the twenty or more apples or peaches on a sm all shoot. They seem to desire the greater number of specimens and poor quality while the market demands the opposite. Good quality and fewer specimens are the better.

All successful fruit growers now expect to thin their fruit, especially their peaches, plums and dwarf pears. It may be accomplished either by picking or by pruning the trees for such a purpose. If the grower resorts to the pruning of his trees to thin his fruit buds and fruit spores are else he might loose too much of his fruit.

GATHERING.

Thomas,* says that mankind consists of two grand divisions _ the careless and the careful. Each individual

* American Fruit Culturist.

may be assigned to his place under these great heads by observing how he picks or gathers his fruit. The careless shake the crop down on the ground or, if picked by the hand, throw the specimens in the basket, rather than carry and deposit them carefully. Such persons wonder why they have such poor luck in keeping fruit for it nearly all rots prematurely..

One cannot be too careful in gathering his fruit if it is to be stored any length of time and even in case it is to be consumed immediately the bruised places on the fruit renders it unattractive and will not bring the best prices. Our people have passed the methods of living that were practiced in remote periods and have now come to the point where, " if anything doesn't look well it doesn't taste well," and for this reason among many others they command attractive fruit and will not pay attractive prices for anything else. So after knowing this it seems to me that everyone should be as careful as possible and try to put the best before the consuming public.

When gathering the fruit, it is advisable to gather what can be reached from the ground first. The pickers should be provided with handled baskets well lined with some soft material for the purpose. Ladders should be

provided for reaching the fruit higher up in the tree and in this case hooked baskets can be used, suspending them in the tree. When the basket is full the man comes down and places them two or three at a time in two-bushel baskets or barrels just as the case may be. In case ~~the~~ that several are picking fruit from the same tree, part can pick from the ground while the others ascend the ladders and pick the fruit higher in the trees. After it has been picked and placed in the boxes or barrels, it should be carefully drawn to the fruit houses on a ~~spring~~ spring wagon to prevent the possibility of bruising. When it reaches the house and being barreled for the car or steamboat it should be handled with the same care as before.

Perhaps a better way to gather fruit than has been mentioned yet is to use a bag in the place of a basket. A common grain bag can be used and answers all purposes.

The mouth can be held open by means of a stick in order that the fruit can be easily placed in. The upper and lower corner should be tied with a strap and slung over the shoulder. This bag is more conveniently handled than the baskets and when they are full the fruit can be emptied out into a barrel without injuring it.

The degree of maturity at which fruit may be picked is another phase which should be taken into considera-

tion. Of course this varies with circumstances and no definite time can be stated as to, when the fruit should be picked. In this case the pickers will have to rely on their judgement. However, there are some definite signs which accompany pears and apples that will enable one to tell when the fruit is ready for gathering. Maturity is indicated by the dark-brown color of the seeds in both pears and apples, but as these cannot be examined, external appearances must serve as a guide. Early apples are best when they attain full color and are beginning to get soft. Winter apples should be mature but not ripe. The late winter varieties should be gathered when they are yet hard and before they have been injured by heavy winter frosts. If they are allowed to remain on the trees in bad weather it is almost useless to store them with the hopes of keeping them long. In such case it will be a loss of both time and money. Maturity in pears, however, is indicated by a slight change in the color of the skin and by the readiness with which the stem separates from the tree when the pear is lifted by the hand. Thomas says that there are exceptions to this rule. He says * that the bartlett, for instance, may be picked even before it has attained full size and in a week or two, will ripen into a fine, melt-

* American Fruit Culturist.

ing texture and ~~melting~~ flavor. A bartlett fully exposed to the sun and allowed to ripen on the tree, or in a well lighted apartment will show, perhaps only a light brown cheek; but if in a dark place the light brown will become a beautiful carmine or crimson.

It has been the general experience that nearly all pears ripen with a much finer flavor if picked and afterward matured in the house. Also gathering the fruit while it is yet hard^{ly} will, in most cases, prevent rotting at the core which, in a great many cases, nearly destroys the value of the fruit if it is picked otherwise.

Mr. H. E. Van Demon* has the following to say in regard to Keiffer pears. "My experience in handling keiffer pears for home market and family use has taught me to gather them before they are fully ripe. They should be left on the trees until they are fully grown and will come off easily by bending their stems where they join the wood. This is usually before the fruit begins to turn yellow. It should at once be put into shallow boxes or crates and stored in a dry cellar or building to ripen that will maintain a steady temperature that is neither too cold or too warm. The warmer it is the sooner the pears will ripen. Judgement should be used

* Rural New Yorker, Sept. 1, 1906.

regarding the time of ripening according to the state of the local market, provided the fruit is to be sold. If it is for home use, the sooner it is ripened the better. As the pears soften they should be sorted over and sold or used at once. If they are not often sorted over there will be a loss from over-ripeness and decay."

It seems to be the general idea Among the pear growers and the fact has been established that it is best to gather pears before they are fully ripe on the trees and immediately haul them into the packing house or storage room and store them in small packages to ripen. I will speak more about this in a later chapter.

ASSORTING AND PACKING THE FRUIT FOR STORAGE PURPOSES.

Perhaps there is as much or more fruit lost as a result of poor assorting and packing as from any other cause. Again a considerable sum of money is lost as a result of carelessly mixing poor and small fruit with the better grades. To demand the better prices on the market, the fruit should be as near as uniform size as possible and above all the diseased fruit should be separated from the sound. No thoughtful herdsman would

think of placing a turburculous cow among his herd of sound cattle for the experience of such ~~has~~ taught him the results that he might expect. It would not be long before his whole herd would be effected and worthless. For the same reason no thoughtful fruit grower should think of packing scabby apples or those that are affected with bitter rot or any other disease with the better grades of his fruit. If so poor keeping and corresponding poor prices will undoubtedly follow. Long keeping apples and pears should be carefully assorted, according to the degree of maturity which they show. Ripe ones soonest decay and if mixed with the hard ones and less mature ones they soon spoil the whole lot. Again separating them when they are packed will avoid frequent picking over afterwards.

The bulk of the apple crop is packed in barrels of which a great many states have a regulation size. However the small boxes, holding a bushel, are coming more and more into use and it is thought by a great many ~~fruit~~ fruit growers and experimenters along this line that fruit will keep best in such packages, for it insures better packing, more careful grading and more care to most all the details. It is also becoming more and more

desirable among all buyers. However, it matters not what kind of a package that is used, the fruit should be packed in such a way that there can be no rattling or as little as possible when moved. They should therefore be shaken several times when packing in order to get them thoroughly settled in the package. A little practice will enable any one to do this without danger of bruising. Lots of times poor keeping is caused by poor packing.

The same principals that are applied in packing apples and pears can be applied to all fruits, small as well. The strawberry, for example, should be packed in small and shallow boxes holding not over a quart and packed in such a way that they will remain steady when being moved. If they are to be sent away or kept in any place for any length of time, they should be given a plenty of ventilation which can be provided by shipping them in open-slat wooden crates. In case of the grapes none but the well grown and the well ripened bunches should be used for this purpose. They are now generally sent to market in small wooden baskets holding from five to ten pounds each. Care being taken to remove all decayed and diseased fruit before packing. so

when gathering, picking or packing if the object is to place the best fruit on the market, establish a good trade and realize the best prices.

CHAPTER, IV

INFLUENCE OF THE DELAY OF STORAGE AND THE TYPE OF PACKAGE.

We have seen that the removal of the fruit from the tree hastens the ripening. As soon as the growth is stopped by picking the fruit matures more rapidly than it does when growing on the tree and maturing at the same time. The rapidity of the ripening increases as the temperature rises and it is checked by a lower temperature. Any condition in the management of the fruit that causes it to ripen after, it is picked brings it just so much nearer the end of its life, whether it is stored in common storage or in cold storage, while treatment that checks the ripening to the greatest possible degree prolongs it. So in view of this fact it is evident that the keeping quality of any fruit will be injured by a delay between the orchard and the storage house of which I will show later on in case of some pears that come under my observation last fall. If the apples or pears are exposed in piles in the orchard, or are kept in hot, close buildings where the air cannot be easily removed from the pile, or if the fruit is put

in tight cars and detained in transit which soon become charged with hot air and cause the fruit to become moist, the ripening goes on rapidly and the fruit may already be near the point of deterioration or may have commenced to deteriorate from scald, mellowness or some other defect when the storage house is reached. While on the contrary if the weather is cool during the shipping period or if the fruit is shipped in refrigerator cars there may not be any serious injury done. The following dealing with this subject is taken from some of the experiments that were carried out by the Department of Agriculture.*

" In the fall of 1901, when the weather in western New York was cool there was no apparent injury from delaying the storage of a large number of varieties two weeks and then shipping the fruit to Buffalo, the transit occupying from one to three days. There was also no apparent injury to the fruit from Virginia treated in a similar manner. But in south-western Missouri, where it was warmer the apples delayed two weeks before storing were seriously injured in their commercial keeping qualities."

" The results accomplished during 1902 have been of

* S. H. Fulton, bulletin 48.

the most instructive character. During the latter half of September the temperature in eastern New York averaged about 62 degrees, F, with a humidity of 84 degrees. During the first half of October the average temperature was 52 degrees F. and the humidity 82 degrees"

Rhode Island Greening, Tompkins King and Sutton apples picked September the 15, 1902 and stored within three days, were firm till the following March, with no rot or scald. But fruit from the same trees not stored until two weeks after picking, was badly scalded or decayed by the first of January., None of the immediate stored fruit was scalded or decayed by the first of February. But the delayed Sutton and Rhode Island Greening were soft and mealy and one-third scalded at that time. While nearly 40 % of the delayed Tompkins King were soft and worthless. The commercial value of these varieties was injured from 40% to 70% by the delayed storage"

Apples of these varieties picked from the same trees on October the 5, 1902 and stored immediately were less injured. Also some stored two weeks later were not so bad as those delayed in September as the temperature was not so high.

INFLUENCE OF TYPE OF PACKAGE.

The principal packages for apples are the three bushel barrels or boxes holding forty or fifty pounds. Pears are often packed in barrels or large boxes, while peaches and most small fruits are packed in packages ~~that~~ that are much smaller. Peaches are sometimes put up in bushel and half-bushel packages but the small basket holding about ten pounds is the most common pack and six or even more of these sometimes placed in a single crate.

People are beginning to realize every year that the small package is the better. The larger the bulk of the fruit and the more it is protected from the air the longer it retains the heat after entering the storage room. The fruit in this condition remains hot in the center for a considerably length of time and the fruit continues to ripen near the center and if it is a quick ripening sort will often become perfectly soft before the fruit can be cooled through. The smaller package therefore presents distinct advantages for the early quick ripening varieties and is most useful in the hottest weather as the fruit cools down quickly throughout the package and its ripening proceeds uniformly. The long-keeping varieties, however, that are harvested and shipped in cooler weather is less liable to be hurt by the large package.

Again what is known as the ventilated barrel is ~~being~~ being very much used by apple growers today. There is a very great difference of opinion as to the merits of this package, while it seems to be beneficial in some respects in others it does not seem to work so well. Its chief value seems to be the greater rapidity with which its contents cools off and its value in this respect depends on the amount of ventilation in the package.

For instance, apples in a poorly ventilated barrel does not seem to cool very much quicker than that of a closed barrel. Therefore if a grower should use this type he should be careful to give proper ventilation or else the extra cost will be lost. It is also contended by some that apples in a ventilated package is liable to shrivel if the fruit is stored for any length of time. this too, will have to be taken into consideration. In the ordinary ventilated barrels the exposure is not sufficient to affect the fruit to any extent but in boxes where there is much exposure the fruit may be corky or spongy in texture if held until spring.

CHAPTER, V

THE INFLUENCE OF WRAPPERS ON THE
KEEPING QUALITIES OF AP-
PLES AND PEARS.

During the winter of 1907-'08 I carried on experiments with apples and pears to determine the keeping quality of fruit under different conditions with particular attention to the efficiency of different kinds of wrapping paper. I have also noticed particularly the difference in the keeping of large and small packages and the influence that the delay in storage will have on pears. I have also taken notes on the behavior of this fruit after being removed from a lower to a higher temperature. In-as-much as I had both pears and apples under observation and the pears were the first to decay I will take them up first.

In the first place I might say that there are many practical difficulties in pear storage. The early ripening varieties which mature in hot weather like the Bartlett often slump before they reach the storage house or are in soft condition, especially if they have been

delayed in ordinary freight cars in transit. They may afterwards decay badly in storage break down quickly on removal or lose their delicate flavor or aroma. When stored in a large package, like the barrel, the fruit, especially the early varieties, often soften in the center of the package while the outside layers remain firm and green. Frequently no two shipments from the same orchard act alike, even when stored in adjoining packages in the same room, and the warehouseman and the owner not always knowing the history of the fruit, are at a loss to understand the difficulty. And in a report from the Department of Agriculture of South Wales on the subject it said that it had been the aim of the Department in the fruit storage investigation to determine as far as possible the reasons of some of the pear storage troubles and to point out the relations of the results to a more rational storage business.

Pears ripen much more rapidly after they are picked than they do in a similar temperature while hanging on the tree. The rapidity of the ripening varies with the character of the fruit, the maturity of the fruit when picked, the temperature in which it is placed and the conditions under which it has been grown. If the fruit

is left in the orchard in warm weather in piles or in packages, if it is delayed in cars or on a railroad siding in transit or if it is put in packages which retain heat for a long time, it continues to ripen and is considerably nearer the end of its life history when it reaches the storage house than would otherwise be the case. The influence in delay in reaching the storage house will therefore vary with the season, with the variety and with the conditions which surround the fruit at this time. A delay of a few days with the quick ripening Bartlett, in sultry weather, might cause the ~~fruit~~ fruit to soften or even decay before it reached the storage house, though a similar delay in clear cooler weather would be less hurtful. A delay of a like period in storing the slow ripening Keiffer would be less injurious although they are hurt by the delay which I will show later.

At the Experiment Station of South Whales they have been carrying on some experiments along this line and from their report I draw the following remarks. From experiments with Bartlett and Keiffer pears it was found that the Bartlett, if properly packed kept in prime condition in cold storage for six weeks, provided they were

stored within forty-eight hours aftern they were picked in a temperature of forty-eight degrees F. but that if the fruit did not reach the storage room until four days after it was picked there was a loss of from twenty to thirty per cent. from softening and decay under exactly similar storage conditions.

The Keiffers stored within forty-eight hours in a temperature of thirty-two degrees F. have been kept in perfect condition until late winter, although there is little commercial demand for them after the holidays. The fruit grown by one man on young trees in 1901 which was still hard and greenish yellow when stored ten days after picking, began to discolor and soften at the core in a few days after entering the storage room. Though the outside of the pears appeared perfectly normal. After forty or fifty days the flesh was nearly all discolored and softened and the skin had turned brown. The fruit from older trees on another farm in 1902 which was smaller and finer in texture appeard to ripen as much as the fruit from the younger trees during the ten days delay. This fruit, however, did not discolor at the core and decay from the inside outward, but continued to rípen and soften in the storage room and was injured at least 50% in its commercial value by the delay.

The results of the experiments point out clearly the injury that may occur by delaying the storage of the fruit after it has been picked and emphasises the importance of a quick transfer from the orchard to the storage house. If the fruit cannot be carried directly to the storage house it is safer to let it stay on the tree until it can be. If the fruit has to be carried long distances to the storage house it is far better to use refrigerator cars. The common freight car is too tight and from lack of ventilation and low temperature the fruit sweats and ripens rapidly. From these remarks it can be seen that the storage room, in lots of cases, is not responsible for the early decay of fruit for it may have been handled under some or all of these conditions, which started the decay before reaching the storage room.

INFLUENCE OF DIFFERENT TEM - PERATURES.

There is no uniformity of temperatures in which pears are stored. Formally a temperature of from 36 to 40 degrees F. was thought best and most desirable,

for it was thought then that a lower temperature discolored the fruit and injured the quality and also it was thought that the pears went too the bad quicker when moved to a hot air. In recent years storage houses carry the pears at a temperature common for apples thirty to thirty-two degrees F. while the Department has carried out experiments with Bartletts and Keiffers in a temperature from thirty-two to thirty-six degrees F. From these experiments it has been found that the fruit kept longer in the cold temperatures and remained in good quality longer after being removed to warmer temperatures.

There is a much wider variation in the keeping of pears when they have been delayed then stored in a temperature of from thirty-two to thirty-six degrees than when stored in the same temperature at once, after being picked. It ripens and deteriorates quickly in high temperatures if it was improperly handled. Lower temperatures keep the fruit longer and is more essential in preventing rapid decay from improper handling.

INFLUENCE OF A WRAPPER.

The life of a fruit when stored away is prolonged

by a wrapper and the advantage of the wrapper is more marked as the season progresses. The wrapper is not so important early in the season but if the fruit is to be kept until late in the winter, it is of great value. It keeps the fruit firmer and brighter. It prevents the spread of fungus spores from one fruit to another and in that way reduces decay. It checks the accumulation of mould in the calyx and stem in fruit that is stored for a long time and prevents bruising and decoloration of light colored fruit.

I was looking over some experiments that were carried on with wrapping in the Department where careful comparisons have been made of the efficiency of tissue parchment, unprinted news paper and waxed paper, but little practical difference has been observed except that a large amount of mould developed on the parchment paper in a temperature of thirty-six degrees F. A double wrapper has proved more efficient for long keeping than a single one and a satisfactory combination consists of an absorbant, unprinted news paper first and that covered with an impervious paraffin wrapper on the outside.

In my own experience with Keiffer pears this winter using different kinds of wraps, I went in the orchard

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on the tenth day of October and gathered the pears, bringing them immediately to the cellar. I took eight samples of them and wrapped them as follows: one sample with tissue paper, one with tissue first then waxed paper, one with tissue first then double waxed, one with waxed paper alone, one with double waxed, one with common brown wrapping paper, one with leaves and a check sample. These pears were weighed and examined once a month and results recorded. The samples that I used were packed in ten pound baskets, just as many as I could pack in and put the cover on well. When the fruit was picked it was just beginning to turn a little yellow and I was careful to leave all the stem on the fruit and pick the best specimens I could find.

The packing was done on the 11, of October and weighed on the twelfth. The weight of each sample when stored was as follows:

NO.	WEIGHT lbs. oz.	DATE	WRAPPING	VARIETY,	STORED
I	5- I	10/12/07,	Tissue,	Keiffer	Cellar
2	5 - 2½	" "	Wax,	"	"
3	5 - 3	" "	Tissue-wax	"	"
4	5 - 5	" "	Wrapping	"	"
5	5- 2½	" "	Tissue-2wax	"	"

NO	WEIGHT	DATE	WRAPPING	VARIETY	STORED
6.....	5 - 6½	10/12/07,	Double wax.....	Keiffer....	Cellar.
7.....	5 - 12,	" "	No wrapping.....	"	 "
8.....	5 - 4 ,	" "	Leaves,	"	 "

As I stated before the fruit when weighed this time was in perfect condition. The principal point about the weighing was to see which sample lost the most. On the 18th, of November the fruit was weighed and examined again, and the weights of each package is given in the table below.

NO.	WEIGHT lbs. oz.	DATE	WRAPPING	VARIETY	STORED
I	4 - 14½	11/18/07,	Tissue	Keiffer,	Cellar
.2	4 - 15¾	" "	Wax,	" ,	"
3 ...	5 - ¼	... "	Tissue-wax,.....	"	"
4 ...	5 - 2¾	... "	Wrapping paper,....	"	"
5 ...	5 - ¼	, ,. "	Tissue-2wax,	"	"
6 ...	5 - 3¾	... "	Double wax,	"	"
7 ...	5 - 5¼	... "	No wrapping,	"	"
8 ...	5 - 00	, ... "	Leaves,	"	"

The above table shows a slight dropping off in weight of the pears. However, they were all in perfect condition at this time and fit for market. They were of

good color and without dark specks. On the 18th of December they were weighed and examined again with a little different results.

NO	WEIGHT lbs. oz.	DATE	WRAPPING	VARIETY	STORED
1	.4 - 11 $\frac{3}{4}$	12/18/07,	Tissue,	Keiffer,	Cellar
2,	.4 - 13 $\frac{1}{4}$, .	" " "	Wax,	" ,	"
3,	.4 - 13 $\frac{1}{4}$, ..	" " "	Tissue-wax,....	" ,	"
4,	5 - $\frac{1}{2}$, ..	" " "	Wrapping paper,.	" ,	"
5,	4 - 13 $\frac{3}{4}$, ..	" " "	Tissue-2wax, ...	" ,	"
6,	5 - 1,	" " "	Double wax,	" ?	"
7,	5 - 2 $\frac{1}{4}$, ...	" " "	No wrapping,....,	" ,	"
8,	4 - 14, ...	" " "	Leaves,	" ,	"

I examined this fruit this time and found that some of it had decayed. I put the perfectly soft fruit and the decayed fruit in the same class as it was not fit for market, and the sound, hard fruit, such as was fit for market to itself and found the following results.

HOW WRAPPED?	DATE	%GOOD	% BAD.
Double wax,....	12/18/07,	100,	0
Single wax, ...	" " " " ,	96,	4
Tissue-2wax,...	" " " ,	98,	2
Wrapping paper, "	" " " ,	100,	0
Tissue,	" " " ,	98,	2
Tissue-wax,....	" " " ,	94,	6

HOW WRAPPED,	DATE?	% GOOD?	% BAD.
Leaves,	12/18/07,	78,	22
No wrapping,..	" " " ; ...	60,	40

So at this examination we see that those wrapped in double wax paper and common wrapping paper were keeping the best. However, those in single wax and tissue paper were a close second. Those that were wrapped in leaves and the lot that had no wrapping at all, I could hardly say that any of them were perfect. In case of the leave they all had more or less mould on them which rendered them unfit for market and those that had no wrapping at all, those that were not entirely decayed had more or less spots on them that would render them undesirable for marketing purposes. However, they were all put away for another months trial.

On the 18th, day of January, 1908, the next and final examination of the pears were made for some of them were getting in such poor condition at this time that it was impossible to carry the experiment any further. However, some of the pears were in perfect condition as the table below will show. And again there is a great difference in results of the different wraps. The fruit at

this time was not weighed as I did not deem it necessary on the account of the poor condition of some of it. Pictures were made of each sample and from the pictures and the table the results can be seen.

WRAPPING?	DATE?	% GOOD,	% BAD
Double wax,	I/I8/08,	64,	36
Wrapping paper, ...	" " " ,	56,	44
Tissue-wax,	" " " ,	68,	32
Tissue paper,	" " " ,	76,	24
Wax,	" " " ,	80,	20
Tissue-2wax,	" " " ,	80,	20
No wrapping,	" " " ,	24,	76
Leaves,	" " " ,	0 ,	100

By the results of the above table, we see that in case of two of the samples that were wrapped there was a percentage of 80 in perfect condition on the 18th, of January, while the sample that had no wrapping at all there was only a percentage of 24 that could be counted good. And in all the samples that were wrapped the good fruit ranked way above that which had no wrapping with the exception of the sample that was wrapped in leaves which was no good at all. Following this are pictures of each lot showing the appearance of it at this time.

PLATE I

Tissue plus wax paper

a, poor fruit

b, good fruit.

This lot was wrapped with tissue paper first then on the outside of this was a wrapping of waxed paper. The picture is rather dark but the general appearance of the fruit can be seen. Lot b, is all fit for the market. There are a few shriveled specimens and a few dark spots but it is all perfectly sound. Also notice the appearance of lot a, which is altogether unfit for anything.

PLATE II

Nowrapping.

a, poor fruit.

b, good fruit.

This fruit had no wrapping at all, notice the poor condition that the fruit in general is in. Lot a, was in such poor condition that it was almost past handling. See the soft appearance, the fungus and the juice running from it while the picture was being made. Notice also lot b, dark blotches can be seen about on it which would hurt the market value of it. However, lot b, is almost sound but as a whole the fruit was in poor condition.

PLATE III

Waxed paper

a, poor fruit.

b, good fruit.

There were only a very few specimens of poor fruit in this lot. Notice the perfect condition of lot b, it was as sound at this examination as it was when it was put away. The fruit was entirely free from blotches. The small dots in the picture was caused by impure developer. The fruit can be judged by the specimens on the left of the pile. This fruit had a desirable color and was in every way in perfect marketable condition.

PLATE IV

Common wrapping paper.

a, poor fruit.

b, good fruit.

When the fruit was examined on the 18th day of December, just one month before this picture was made, this lot of fruit was one of the two best lots. But the last month it was in the cellar, from the 18th, of December to the 18th, of January it went to the bad fast. Only 56%, just a little over half, was good at this time, while on the 18th of December all of it was good.

PLATE V

Double waxed paper.

a, poor fruit

b, good fruit.

This lot of fruit was not hardly so good as ~~the rest~~ some of the rest. While at this examination 64% of it is recorded as good, still it was not in perfect condition. There were a few dark spots on it as can be seen in the picture that would make its market value less. However, lot b, was perfectly sound and other than the loss in appearance, it was good. Lot a, was entirely decayed.

PLATE VI

Tissue paper.

a, poor fruit.

b, good fruit.

While fruit b, of this sample was sound it was a little splotched as can be seen in the picture. However, 76% of the lot wrapped in tissue paper was good and sound and would have done very well to put on the market. The remaining 24% was perfectly decayed as can be seen at a,. Entirely unfit for any purpose.

PLATE VII

Tissue plus double waxed.

a, poor fruit.

b, good fruit.

This lot of fruit wrapped in tissue paper then two thicknesses of waxed paper and lot three wrapped with waxed paper alone kept better than any of it. 80% in perfect condition, bright and firm and in first class market condition. Notice the bright appearance of the sound fruit.

PLATE VIII

Wrapped in leaves.

All poor.

All the fruit that was wrapped in leaves was entirely worthless. I simply show a sample of the lot. All of it was just as can be seen in the plate. Entirely decayed and covered with mould. This was due to the dampness and green condition of the leaves when the fruit was put away.

From the foregoing tables and photographs of the fruit it can be seen that some kind of wrapper is entirely essential for the best keeping of pears. It not only prolongs the life of the fruit, but the wrapper keeps the fruit in a brighter appearance. In my own observation, fruit wrapped in tissue and waxed paper seems to keep the best. The chief advantage of the wrapper for fruit that is stored for only a short while would be more for mechanical protection than anything else, rather than its efficiency to prolong the season. However, its use for this purpose is advisable if the fruit is of a superior grade and intended for a first class market; For fruit of the late varieties, the wrapper has the same advantage with the additional advantage of increasing the commercial life of the fruit. It is especially efficient if the package is not tight in lessening the wilting. Again, if fruit is wrapped, when one specimen begins to decay, the wrapper will prevent the fungus spores going from the decayed fruit to the sound and from my own observation I believe that fruit first wrapped with tissue paper and then waxed paper on the outside will keep the best, for the reason that the waxed paper will better prevent the moisture and decaying spores from the already decaying fruit to enter

into the sound. And the tissue paper next to the fruit serves also as a protection to the fruit and also to the spores that should happen to get through the waxed paper.

BEHAVIOR AFTER BEING REMOVED FROM THE CELLAR.

When removing the fruit from the cellar this time, I reserved several samples of it to observe the effects of higher temperatures on it after being brought direct out of the cool cellar. I placed one sample of rather soft fruit, but not decayed, and one of firm in the photograph room where the temperature ranged from 65 to 75 degrees F. all the time. I examined it from time to time and found that within twenty-four hours after the soft fruit had been placed in the high temperature it was beginning to shrivel, while the firm had not changed any a hardly. In another day or two the soft fruit began to change its color and decay soon set in while the hard fruit remained perfectly firm for four days and without losing its color. And it was about four days longer before decay finally set in. I also placed like samples in a room where the temperature averaged about fifteen de-

grees lower and samples of a like kind in a room that was still cooler and found the same results but not so quickly as did in the higher temperatures. So we can see that the rapidity of deterioration after it is taken from a cooler place and put into a warmer depends principally on the nature of the fruit, on its degree of maturity when it leaves the storage room and on the temperature in which it is stored. The Department of Agriculture of South Wales has carried out experiments along this line and the results were similar except more marked and more in detail. From these observations, I contend that it will not pay to keep fruit off the market until it gets overripe. It must be put on the market while it is firm and then kept as cool as possible.

STORAGE AFTER LYING ON GROUND

FOR TEN DAYS.

When gathering this fruit there was a small pile left lying out in the orchard under one of the trees. So just ten days after I had gathered my other fruit, I went back to the orchard and brought in a basket of this

fruit and placed it under the same conditions as that which I had stored. When this fruit was brought in, it had the appearance of perfectly ripe fruit, yet it was still firm. The weather had been rather warm, during the time the temperature ranged anywhere from 55 to 75 degrees F. in the middle of the day. After these pears had been in the cellar for about three weeks they began to get soft and in a very short while rapid decay set in. And in a few days more the entire lot was worthless. The delay of ten days in storing this fruit made a difference of at least two weeks in the period of keeping and the appearance of it was undesirable all the time.

EXPERIMENT WITH THE PACKAGE.

When these pears were stored in the cellar, we had several barrels full and a great many stored in boxes of various sizes. As I had been reading results of experiments with different kinds and sizes of packages, I decided to watch this fruit and see the results. The pears were put away about the tenth of October. The latter part of November I examined the fruit in the barrels and found it to be perfectly ripe in the center of the

barrel and beginning to get soft and the skin was beginning to turn dark. The fruit on top was still firm and of a better color. The fruit that was in a box of about half the size was not half so bad and that in a very small package half-bushel or less, was all still firm. By the latter part of Dec. the fruit in the barrels was no good at all, yet the smaller packages still remained in good condition with the exception of a few specimens.

INFLUENCE OF THE WRAPPER IN HIGHER TEMPERATURES.

To try the influence of a wrapper in higher temperatures, I placed a sample of each method of wrapping in a room where the temperature ranged all the way from 40 to 70 degrees. One month after this fruit was put in there, upon examination I found it all perfectly ripe, a lot of it soft and turning a dark color. I put it back and in three weeks later, seven weeks from the time it was stored I examined it the second time and found the following results.

NO.	WRAPPING.	%GOOD	%BAD.
1,	Waxed paper,	55	45
2,	Leaves,	20	80
3,	Tissue-wax,	48	52
4,	Tissue-2wax,	60	40
5,	Tissue,	28	72
6,	Double waxed,	76	24
7,	Wrapping paper,	45	55
8,	Check,	0	100

By taking a glance at the above table we can see that the wrapper is beneficial in order to keep fruit any length of time and, as in the lower temperature, the waxed paper seems to have the greater effect on the preservation of the fruit. This fruit was also weighed twice but as the results were simply a gradual falling off, as in case of the pears in the cellar, I did not think it necessary to record them here.

The conclusions that I have come to after having seen the results of this experiment are that in order to keep fruit in good condition for any length of time, we must treat it fair. If while gathering and packing it away, we handle it rough we may expect rough results.

Again, it will not do to crowd the fruit. It needs ventilation as well as people and in order to give this we must use packages that are smaller than the barrel. In my own estimation a package that is larger than a bushel box is undesirable and a half-bushel box is better. Furthermore some kind of a wrapper is essential for long keeping and the waxed paper seems to be the most beneficial. And last but not least the fruit must be removed before it gets soft and keep in as cool place as possible.

PART II

EXPERIMENT WITH THE APPLES.

In this country wealth is obliged to pay respect to popular opinion. And of all the fruits the apple is the most democratic. This popular favor of the apple arises from the nature of the tree and the fruit. Any man who can grow corn can grow apples.

"In every soil and in the most discouraging circumstances the apple tree lives and thrives. It can bear high or low cultivation. It is not dyspeptic like the peach, apoplectic like the pear or scrofulous like the plum. The apple is among the fruits like the cow among the animals, like the camel and like all good things uncomely -- for beauty is only the mark which covers everything that is evil.

We should as soon think of coddling our forest trees as the apple tree. It will thrive in the stony lot too steep for the plough or grow in the meadow and repay us for the more abundant nutrition."*

HISTORY AND PRINCIPAL SECTIONS OF APPLE PRODUCTION.

The apple is the fruit of a tree belonging to the rose family and known botanically as "Pyrus Malus". It is supposed to be a native of South Eastern Asia

and of a large part of Europe. It has been cultivated from ~~time~~ immemorial. There are a number of species of the Wild apple in America, two of which (*Pyrus Coronaria* and *Pyrus Ioensis*) appear to possess some value as possible fruit plants. The apple is the most important fruit of the Temperate climates and is peculiarly adapted to a large area of North America, where it occupies a larger area than any other fruit. One feature which makes it so important is the fact that when the market is glutted it can be disposed of in more ways than any other fruit. A large number of its varieties keep well, withstand shipment to and sell well in distant markets. The tree readily adapts itself to great extremes of climate, soil and other conditions. It is , in fact, the only fruit ~~that~~ that has passed the bounds of luxury and become a staple article of food except in the tropics. Its range extends, in the Northern Hemisphere, from Scandinavia to the mountainous part of Spain. From New Brunswick to the highlands of Georgia. And from British Columbia to the mountains of Mexico.

The great apple producing countries of the world are the United States, ^{and} Canada, Australia and adjacent

islands, Russia and Germany. In America the principal apple districts are Nova Scotia, New England, New York, Pennsylvania, Ontario, Ohio, Michigan, Kentucky and the central western states. Other younger sections are the Piedmont sections of Virginia, West Virginia, North Carolina and Tennessee. The Pacific Coast states and British Columbia.

The apple is profoundly influenced by latitude and climate. In the North Eastern states and Canada, the fruit is very firm, highly colored, of high flavor and long keeping qualities. As the apple regions extend southward the fruit takes on a duller or less intense color and loses much of its flavor, has a tendency to become larger and the keeping qualities are very greatly diminished. Thus the Tompkins King, which is one of the standard winter apples of the northernmost states, becomes a fall apple in Kentucky. A knowledge of these influences of climate on the apple is of great importance to the fruit grower.

After the apple was distributed over such a large area and so many more were being grown than could be consumed in a short while, it became necessary for the grower to adapt some method in which he could hold

a part of his crop back for a later season. Thus the Cold Storage was looked to for this purpose.

The fact that in most climates vegetable and animal products were robbed of the principal of life decay rapidly, in warm temperatures and resist decay in cold atmospheres had, of course, been known through all history. But the value of the practical application of that great truth of Nature in the affairs of every day life had not been understood until the present generation. But now it has been demonstrated that great store houses, holding thousands of bushels of select fruit can be filled with cold air and so steadily and evenly held at a low temperature that the fruit, in its natural state, can be kept in almost perfect condition nearly all the year round.

Apples, like all other products, if left to themselves, will undergo a series of changes to which the term decay is applied. The decay, or rotting of apples is caused chiefly by fungi, of which there are three species most commonly the cause of apple decay.

Black Rot, in this the apple shows on the surface one or more brown spots which gradually spread until the whole apple is involved. Later the surface be-

comes darker or quite black in color and is seen to be studded with minute pimples. These are the fruiting of the fungus which causes the rot and contain the spores by which it is propagated.

Bitter Rot; This rot is similar to the naked eye as the foregoing but produces darker spots and the pulp has a bitter taste.

Soft Rot: Perhaps this is the most common one of them all and causes more trouble to the fruit grower. In this form the color of the rotting area is lighter than in the preceeding forms, Being lighter or yellowish brown and the pulp may become very soft. The fruiting of this fungus occurs in white rounded tufts upon the surface, the tufts taking on later a bluish color due to the matured spores.

The spores of the fungi causing these rots are produced in immense numbers, especially in case of the last mentioned form and as they are easily floated by light currents of air, they are widely distributed and in all ordinary forms of handling, apples are more or less exposed to infection by them. However certain precautions will tend to limit the danger. Apples barreled in the orchard will be less liable to be infected

than if they are previously stored, uncovered in a dusty barn or a mouldy cellar. The barrels themselves are liable to be sources of infection unless they are thoroughly cleaned. Heat and moisture favor the development of rot producing fungi, hence the advisability of storing in a cool, dry place. So we see it is impossible to be too particular with our fruit when storing it.

What was said concerning the gathering, immediate storage, maturity, type of package etc. of the pears will apply as well to the apples and in view of this fact it will be useless to go into the details of these topics again.

INFLUENCE OF A WRAPPER.

During the winter of 1907 - 08, I took samples of six varieties of apples and wrapped them the same way as I did the pears to see if there was any difference in the efficiency of the different wrappers in retaining the quality of the fruit. The varieties that I had under observation were Greening, Baldwin, Spitzenburg, Rambo, Bellflower and one unknown. These

apples were weighed and examined once a month from the time they were put in the cellar, Oct. 20. up until the 18th, of April.

Following this are tables of results of this test taking the varieties up in the order named above.

GREENING.

WRAPPING	Date	WEIGHT		DATE.	WEIGHT	
		lbs.	oz.		lbs.	oz.
Tissue paper	10/20/07	3	5 $\frac{1}{2}$	11/18/08	3	5
Waxed paper	"	3	10 $\frac{1}{2}$	"	3	10 $\frac{1}{4}$
Check	"	3	7 $\frac{1}{2}$	"	3	7 $\frac{1}{4}$
Double waxed	"	3	4	"	3	3 $\frac{1}{4}$
Wrapping paper	"	3	14 $\frac{1}{2}$	"	3	14
Tissue, plus waxed	"	3	12	"	3	11 $\frac{1}{2}$
Tissue " 2 "	"	3	10	"	3	9 $\frac{3}{4}$
Leaves.	"	3	7	"	3	5 $\frac{1}{4}$

The above table shows the first two weighings of this fruit. The first one, which was made on the 20th, of October represents the weight of the fruit when it was put in the cellar. The second one, Nov. 18th, represents the weight of the fruit one month later. It can be seen that there was a slight decrease in weight.

The following table shows the 3, 4, 5, and 6, weighing.

3d, and 4th,

WRAPPING.	Date.	WEIGHT. lbs. oz.	DATE	WEIGHT. lbs. oz.
Tissue paper	12/18/07	3 4 $\frac{1}{4}$	1/18/07	3 5 $\frac{1}{4}$
Waxed paper	"	3 9 $\frac{1}{2}$		3 9
Check	"	3 6 $\frac{1}{2}$		3 5 $\frac{3}{4}$
Double waxed	"	3 3		3 2 $\frac{1}{2}$
Wrapping paper	"	3 13 $\frac{1}{2}$		3 12 $\frac{3}{4}$
Tissue plus waxed	"	3 11		3 10 $\frac{1}{4}$
Tissue " 2 "	"	3 9 $\frac{1}{2}$		3 8 $\frac{3}{4}$
Leaves	"	3 4 $\frac{3}{4}$		3 4

5th and 6th weighing

WRAPPING.	Date.	WEIGHT. LBS. OZ.	DATE.	WEIGHT
Tissue paper	3/18/08.	3 2 $\frac{3}{4}$	2/18/08.	# 2 $\frac{3}{4}$
Waxed paper	"	3 7 $\frac{3}{4}$	"	3 8 $\frac{1}{4}$
Check	"	3 4 $\frac{3}{4}$	"	3 5 $\frac{1}{4}$
Double waxed	"	3 1 $\frac{1}{2}$	"	3 1 $\frac{3}{4}$
Wrapping paper	"	3 11 $\frac{1}{4}$	"	3 12
Tissue plus waxed	"	3 9	"	3 9 $\frac{3}{4}$
Tissue " 2 "	"	3 7 $\frac{1}{2}$	"	3 8
Leaves	"	3 2 $\frac{3}{4}$	"	3 3 $\frac{1}{2}$

During Jan. and Feb. there was some very cold weather and during this weather the apples froze. So at this examination, 3d of March, the fruit was beginning to shrivel from the effects of the cold. However they were put back for another months trial.

The following table shows the weight of the fruit on the 18th, of ~~Mar~~ April and also the amount the fruit decreased in weight during the time it was stored.

7th weighing,

Decrease in weight.

WRAPPING.	DATE.	WEIGHT:		DECREASE.
		LBS.	OZ.	oz.
Tissue paper	4/18/08	3	1½	4
Waxed paper	"	3	6¾	3¾
Check	"	3	3¾	2¾
Double waxed	"	3	¾	3¼
Wrapping paper	"	3	10	4½
Tissue plus waxed	"	3	8	4
" " 2 "	"	3	6½	3¾
Leaves	"	3	1¾	5¼

The sample that was wrapped in leaves was the greatest loser while the one wrapped in common wrapping paper was the next. The check sample lost less than any of the rest.

The following table shows the per cent of good and bad fruit in each sample.

WRAPPING.	%GOOD	%BAD.
Tissue paper	100	0
Waxed paper	100	0
Check	80	20
Double waxed	100	0
Wrapping paper	70	30
Tissue plus waxed	100	0
" " 2 "	100	0
Leaves	000	100

The above table shows the condition of the fruit when it was examined on the 18th, day of April 1908. In this lot the sample wrapped with double waxed paper kept better than any of the rest. It decreased less in weight than any other sample and also 100 per cent of it was good. While the check sample lost less in weight there was at least 20 per cent of the fruit that was worthless and none of it was in first class condition. The sample that was wrapped in leaves was all entirely worthless. All of this fruit, however, showed the effects of cold weather. The average decrease in weight

of this fruit was a little over an ounce per pound with the exception of the lot wrapped in leaves which lost nearly two ounces per pound.

BALDWIN.

This lot of fruit was handled in the same manner as the preceeding one, the weighings being made on the same dates. The first weight being made when the fruit was put away.

Ist, and 2nd, weighing.

WRAPPING.	DATE	WEIGHT LBS. OZ.	DATE	WEIGHT lbs. oz
Tissue plus waxed	10/20/07	3 3½	11/18/07	3 3½
Wrapping paper	"	3 11	"	3 11
Double waxed	"	3 4½	"	3 4½
Tissue plus 2 waxed	"	3 5	"	3 5
Tissue	"	3 7	"	3 7
Waxed	"	3 12½	"	3 12¼
Leaves	"	3 9	"	3 9
Check.	"	3 6	"	3 6

It will be noticed that this lot of fruit didn't

decrease any at all in weight with the exception of the sample wrapped in single waxed paper and it only decreased one-quarter of an ounce during the month.

3d. and 4th. weighing.

WRAPPING	DATE.	WEIGHT		DATE.	WEIGHT	
		lbs.	oz.		lbs.	oz.
Tissue plus waxed	12/18/07	3	2 $\frac{3}{4}$	1/18/08	3	2
Wrapping paper	"	3	10	"	3	9 $\frac{1}{4}$
Double waxed	"	3	4 $\frac{1}{2}$	"	3	3 $\frac{1}{2}$
Tissue plus 2 waxed	"	3	4 $\frac{1}{2}$	"	3	3 $\frac{3}{4}$
Tissue	"	3	6	"	3	5
Waxed	"	3	11 $\frac{3}{4}$	"	3	11
Leaves	"	3	8 $\frac{1}{2}$	"	3	7 $\frac{3}{4}$
Check	"	3	5 $\frac{1}{2}$	"	3	4 $\frac{3}{4}$

The results of the above table show that the fruit at this time was beginning to decrease in weight more than it did from the first to the second. At this time the fruit was all perfectly sound. No difference could be detected except possibly a little deeper color.

The next table shows the fifth and sixth weighing which was made on the 18th of February and the 18th, of March.

5th, and 6th, weighing.

WRAPPING.	DATE	WEIGHT		DATE	WEIGHT	
		lbs.	oz.		LBS	OZ.
Tissue plus waxed	2/18/08	3	1 $\frac{1}{4}$	3/18/08	3	3
Wrapping paper	"	3	8 $\frac{1}{2}$	"	3	8
Double waxed	"	3	3	"	3	2 $\frac{1}{2}$
Tissue plus 2 waxed	"	3	3 $\frac{1}{4}$	"	3	3
Tissue	"	3	4 $\frac{1}{2}$	"	3	4
Waxed	"	3	10 $\frac{1}{2}$	"	3	10
Leaves	"	3	7 $\frac{1}{4}$	"	3	7
Check	"	3	4 $\frac{1}{2}$	"	3	3 $\frac{3}{4}$

The following table shows the seventh weighing and also the decrease in weight of each sample during the time it was stored.

7th, weighing

loss in weight.

WRAPPING	DATE	WEIGHT		TOTAL LOSS
		lbs.	oz.	oz.
Tissue plus waxed	4/18/08	3		3 $\frac{1}{2}$
Wrapping paper	"	3	6 $\frac{3}{4}$	4 $\frac{1}{4}$
Double waxed	"	3	1 $\frac{1}{2}$	3
Tissue plus 2 waxed	"	3	2	3
Tissue	"	3	3	4
Waxed	"	3	9 $\frac{1}{4}$	3 $\frac{1}{4}$
Leaves	"	3	6 $\frac{1}{4}$	2 $\frac{3}{4}$
Check	"	3	3	3

Again we see from the preceding tables that the average loss in weight of the fruit was about one ounce to the pound. The sample wrapped in common wrapping paper lost more in weight than any of the other samples.

The following table shows the per cent of good and bad fruit at this time

WRAPPING	%GOOD	%BAD
Tissue plus waxed	100	0
Wrapping paper	90	20
Double waxed	100	0
Tissue plus 2 waxed	90	10
Tissue	100	0
Leaves	100	0
Check	80	20
Waxed	100	0

It will be noticed in the above table that I have the sample that was wrapped in leaves marked 100 per cent good. Although none of the fruit could be put aside as decayed yet it was not in a first class condition which resulted from the mouldy condition of the leaves that gave the fruit an undesirable appearance. Again the sample which had no wrapping at all did not

have as good and clean appearance as the fruit that was wrapped and it was also in a more withered condition. All of the rest, however, with the exception of the sample that was wrapped in common wrapping paper and that wrapped in tissue plus two waxed was in perfect condition and could have been put on the market apparently as good as it was when it was stored.

SPITZENBURG.

This lot of fruit was handled in the same manner as the two preceeding as well as all the other varieties that I had in the experiment. Like the other varieties there was a gradual decrease in weight. The following table shows the first and second weights.

1st and 2nd weighing.

WRAPPING	DATE	WEIGHT		DATE	WEIGHT
		lbs.	oz.		LBS.OZ
Tissue paper	10/20/07	3	5½	11/18/07	3 4¾
Waxed paper	"	3	5	"	3 4½
Tissue plus waxed	"	3	3	"	3 2
Wrapping paper	"	3	2	"	3 1
Leaves	"	3	4½	"	3 5½
Check	"	3		"	2 15½
Tissue plus two waxed	"	3	5½	"	3 4½
Double waxed	"	3	5	"	3 4

3d and 4th weighing

WRAPPING	DATE	WEIGHT lbs. oz.		DATE	WEIGHT LBS.OZ.	
Tissue paper	12/18/07	3	3 $\frac{3}{4}$	1/18/08	3	3
Waxed paper	"	3	3 $\frac{1}{2}$	"	3	2 $\frac{3}{4}$
Tissue plus waxed	"	3	1 $\frac{1}{4}$	"	3	$\frac{3}{4}$
Wrapping paper	"	3	$\frac{1}{4}$	"	2	15 $\frac{3}{4}$
Leaves	"	3	2 $\frac{1}{2}$	"	3	1 $\frac{3}{4}$
Check	"	2	14 $\frac{3}{4}$	"	2	14
Tissue plus 2 waxed	"	3	3 $\frac{3}{4}$	"	3	3
Double waxed	"	3	3 $\frac{1}{2}$	"	3	2 $\frac{1}{2}$

The fruit at this examination was in a perfect condition. Not a single specimen showed any sign of decay. However, like the rest it had lost quite a bit in weight

5th and 6th weighing.

WRAPPING	DATE	WEIGHT. lbs.oz.		DATE	WEIGHT LBS.OZ.	
Tissue paper	2/18/08	3	2 $\frac{1}{2}$	3/18/08	3	1 $\frac{3}{4}$
Waxed paper	"	3	2 $\frac{1}{4}$	"	3	1 $\frac{1}{2}$
Tissue plus waxed	"	3		"	2	15 $\frac{1}{4}$
Wrapping paper	"	2	15	"	2	14 $\frac{1}{2}$
Leaves	"	3	1	"	3	
Check	"	2	13 $\frac{1}{4}$	"	2	12 $\frac{1}{2}$
Tissue plus 2 waxed	"	3	2 $\frac{1}{4}$	"	3	1 $\frac{1}{4}$
Double waxed	"	3	1 $\frac{1}{4}$	"	3	1

The following table shows the seventh weighing of the fruit and also the decrease in weight of each sample during the time it was stored.

7th weighing		decrease in weight		
WRAPPING?	DATE	WEIGHT		DECREASE.
		lbs	oz.	lbs. oz.
Tissue paper.	4/18/08	3	$\frac{1}{2}$	5
Waxed paper	"	3	$\frac{1}{2}$	$4\frac{1}{2}$
Tissue plus waxed	"	2	14	5
Wrapping paper	"	2	$13\frac{1}{4}$	$7\frac{1}{4}$
Leaves	"	2	15	$5\frac{1}{2}$
Tissue plus 2 waxed		3		$5\frac{1}{2}$
Double waxed	"	3		5
Check	"	2	11	5

It will be noticed that this lot of fruit lost more in weight than any of the other varieties that has been recorded so far. The decrease in weight of this variety was nearly two ounces to the pound.

The table following this shows the per cent of good and bad fruit that was in this lot of apples at this examination, which was made on the eighteenth of April 1908.

WRAPPING	%GOOD	%BAD.
Tissue paper	95	5
Waxed paper	100	0
Tissue plus waxed	100	0
Wrapping paper	100	0
Leaves	80	20
Check	60	40
Tissue plus 2 waxed	100	0
Double waxed	100	0

It will be seen that I marked 60% of the check sample good. While doing this I feel that the whole lot should be marked as inferior fruit on the account of the wilted condition that it was in. All of it, however was slightly wilted but the check sample showed more of it than any of the rest and also the appearance of the fruit was not so good as the samples that were wrapped. Again the sample that was wrapped in leaves did not have any first class specimens on the account of the mould that was on the fruit. The sample that was wrapped in single waxed paper decreased less in weight than any of the rest and there being 100% of it that was good I put it first in this lot.

RAMBO

This variety of apples seemed to keep better than any other variety that I had in the experiment. Nearly all of it was perfectly sound at the last examination. Also they did not wither so bad as some of the rest.

The following tables show the general decrease in weight of this fruit.

1st. and 2nd. weighing.

WRAPPING	DATE	WEIGHT. lbs.oz.	DATE	WEIGHT lbs.oz
Tissue paper	10/20/07	2 13	11/18/07	2 11 $\frac{3}{4}$
Waxed paper	"	2 12	"	2 11 $\frac{1}{4}$
Wrapping paper	"	2 13 $\frac{1}{2}$	"	2 12 $\frac{1}{4}$
Tissue plus waxed	"	2 15	"	2 14 $\frac{1}{2}$
Leaves	"	2 12	"	2 11 $\frac{1}{4}$
Check	"	2 13	"	2 12 $\frac{1}{2}$
Tissue plus 2 waxed	"	3, 1 $\frac{1}{2}$	"	3 $\frac{1}{2}$
Double waxed.	"	2 12 $\frac{1}{2}$	"	2 11 $\frac{3}{4}$

Perhaps this variety lost more in weight than any of the others between the first and second weighing.

The following table shows the 3d and 4th weighing.

3d and 4th weighing

WRAPPING	DATE	WEIGHT lbs. oz.	DATE	WEIGHT lbs. oz.
Tissue paper	12/18/07.	2 11 $\frac{1}{4}$	1/18/08	2 10 $\frac{1}{2}$
Waxed paper	"	2 10 $\frac{1}{2}$	"	2 10
Wrapping paper	"	2 12	"	2 11 $\frac{1}{4}$
Tissue plus waxed	"	2 13 $\frac{3}{4}$	"	2 13
Leaves	"	2 10 $\frac{1}{2}$	"	2 10
Check	"	2 11 $\frac{3}{4}$	"	2 11 $\frac{1}{4}$
Tissue plus 2 waxed	"	3	"	2 15 $\frac{1}{2}$
Double waxed	"	2 11 $\frac{1}{4}$	"	2 10 $\frac{1}{2}$

5th and 6th weighing

WRAPPING	DATE.	WEIGHT lbs. oz.	DATE	WEIGHT lbs. oz.
Tissue paper	2/18/08	2 10	3/18/08	2 9 $\frac{3}{4}$
Waxed paper	"	2 9 $\frac{1}{2}$	"	2 9 $\frac{1}{2}$
Wrapping paper	"	2 10 $\frac{3}{4}$	"	2 10 $\frac{1}{2}$
Tissue plus waxed	"	2 12 $\frac{1}{2}$	"	2 12
Leaves	"	2 9 $\frac{1}{2}$	"	2 9 $\frac{1}{2}$
Check	"	2 11	"	2 10 $\frac{1}{2}$
Tissue plus 2 waxed	"	2 15	"	2 14 $\frac{3}{4}$
Double waxed	"	2 10 $\frac{1}{4}$	"	2 10

The fruit at this time was all perfectly sound and fit to be put on the market.

The following table shows the seventh weighing and also the decrease in weight of the fruit.

7th weighing		decrease in weight	
WRAPPING	DATE	WEIGHT	DECREASE
		lbs. oz.	oz.
Tissue paper	4/18/08	2 8 $\frac{3}{4}$	4 $\frac{1}{4}$
Waxed paper	"	2 8 $\frac{3}{4}$	3 $\frac{1}{4}$
Wrapping paper	"	2 9 $\frac{3}{4}$	3 $\frac{3}{4}$
Tissue plus waxed	"	2 11 $\frac{1}{2}$	3 $\frac{1}{2}$
Leaves	"	2 8 $\frac{3}{4}$	3 $\frac{1}{4}$
Check	"	2 9 $\frac{3}{4}$	3 $\frac{1}{4}$
Tissue plus 2 waxed	"	2 14	3 $\frac{1}{2}$
Double waxed	"	2 9 $\frac{1}{4}$	3 $\frac{1}{4}$

Taking everything in consideration this sample of fruit kept better than any other sample that I had in the experiment. The sample that was wrapped in tissue paper alone decreased more in weight than any of the rest. The average shrinkage, however, was just about like the other varieties, slightly more than one ounce to the pound.

On examining this fruit at this time I found that there was only one sample that had any decayed specimens in it at all and that was the sample wrapped with

tissue paper plus waxed. There was only two specimens in this that was decayed. In view of this fact it will be useless to give a table showing the good and bad fruit of this lot for it can be said that it was almost perfect throughout.

BELLFLOWER.

The following table shows the first and second weighing of this fruit, the first one being made when it was put away.

1st and 2nd weight.

WRAPPING	DATE	WEIGHT lbs.oz.	DATE	WEIGHT lbs.oz.
Waxed paper	10/20/07	4 6	11/18/07	4 5 $\frac{1}{2}$
Tissue paper	"	3 13 $\frac{1}{2}$	"	3 13 $\frac{1}{2}$
Check	"	3 9	"	3 9 $\frac{1}{4}$
Wrapping paper	"	4 1	"	4 $\frac{1}{2}$
Tissue plus waxed	"	3 9 $\frac{1}{2}$	"	3 9 $\frac{1}{4}$
Double waxed	"	3 15	"	3 14 $\frac{1}{2}$
Leaves	"	3 14 $\frac{1}{2}$	"	3 13 $\frac{3}{4}$
Tissue plus 2 waxed	"	3 12 $\frac{1}{2}$	"	3 12 $\frac{1}{4}$

The next table shows the 3d and 4th weighing.

3d and 4th weighing.

WRAPPING	DATE	WEIGHT lbs.oz.	DATE	WEIGHT lbs.oz.
Waxed paper	12/18/07	4 4 $\frac{1}{4}$	1/18/08	4 2 $\frac{3}{4}$
Tissue paper	"	3 12 $\frac{1}{2}$	"	3 11 $\frac{1}{2}$
Check	"	3 8 $\frac{1}{4}$	"	3 7
Wrapping paper	"	3 15 $\frac{1}{2}$	"	3 14 $\frac{1}{4}$
Tissue plus waxed	"	3 9	"	3 7 $\frac{3}{4}$
Double waxed	"	3 13 $\frac{3}{4}$	"	3 12 $\frac{3}{4}$
Leaves	"	3 12 $\frac{3}{4}$	"	3 11 $\frac{1}{2}$
Tissue plus 2 waxed	"	3 12.	"	3 11

5th and sixth weighing.

WRAPPING	DATE	WEIGHT lbs.oz.	DATE	WEIGHT lbs.oz.
Waxed paper	2/18/08	4 1 $\frac{1}{2}$	3/18/08	4 $\frac{3}{4}$
Tissue paper	"	3 10	"	3 9 $\frac{1}{2}$
Check	"	3 6 $\frac{1}{4}$	"	3 5 $\frac{3}{4}$
Wrapping paper	"	3 13 $\frac{1}{4}$	"	3 12 $\frac{3}{4}$
Tissue plus waxed	"	3 6 $\frac{3}{4}$	"	3 6 $\frac{1}{2}$
Double waxed	"	3 12	"	3 11 $\frac{1}{2}$
Leaves	"	3 10 $\frac{3}{4}$	"	3 10 $\frac{1}{2}$
Tissue plus 2 waxed	"	3 10 $\frac{1}{2}$	"	3 10

At this time the fruit was in perfect condition.

There was hardly any change in appearance of it since it was put in the cellar.

The following table shows the seventh weighing and the entire decrease in weight of the fruit.

7th weighing.		decrease in weight.	
WRAPPING	DATE	WEIGHT	DECREASE.
		lbs. oz.	oz.
Waxed paper	4/18/08	3 13 $\frac{3}{4}$	8 $\frac{1}{4}$
Tissue paper	"	3 8	5 $\frac{1}{2}$
Check	"	3 4 $\frac{1}{4}$	4 $\frac{3}{4}$
Wrapping paper	"	3 11 $\frac{1}{4}$	5 $\frac{3}{4}$
Tissue plus waxed	"	3 5 $\frac{1}{2}$	4
Double waxed	"	3 10 $\frac{1}{2}$	4 $\frac{1}{2}$
Leaves	"	3 9 $\frac{1}{2}$	5
Tissue plus 2 waxed	"	3 9	3 $\frac{1}{2}$

The results show that the sample wrapped in waxed paper alone decreased more in weight than any of the other samples while the sample wrapped in tissue plus double waxed decreased less than any of the rest. The decrease in this averaged a little more than an ounce to the pound.

The following table shows the per cent of good and bad fruit that was in this lot. On the whole this variety did not keep so well as some or perhaps all of the varieties that have been recorded so far.

WRAPPING	%GOOD	%BAD
Waxed paper	90	10
Tissue paper	80	20
Check	70	30
Wrapping paper	90	10
Tissue plus waxed	100	0
Double waxed	90	10
Leaves	85	15
Tissue plus 2 waxed	100	0

By a glance at the two last tables it will be seen that the sample that was wrapped in tissue plus two waxed papers kept better than any of the other samples. This sample lost only $3\frac{1}{2}$ ounces which was less than any of the rest and at the end of the test there was 100 per cent of it good. The next best sample was the one wrapped in tissue plus waxed.

VARIETY UNKNOWN.

This was the poorest keeping variety that I had under consideration. When the last examination was made most of the fruit was in poor condition.

The following table shows the first and second weights of the fruit.

1st and 2nd weighing

WRAPPING	DATE.	WEIGHT. lbs.oz.	DATE	WEIGHT lbs.oz.
Waxed paper	10/20/07	3 10 $\frac{1}{2}$	11/18/07	3 10
Tissue plus waxed	"	3 13 $\frac{1}{2}$	"	3 12 $\frac{1}{2}$
Double waxed	"	4 3 $\frac{1}{2}$	"	4 2 $\frac{1}{2}$
Tissue plus 2 waxed	"	4 4	"	4 3 $\frac{1}{4}$
Tissue	"	3 11	"	3 10 $\frac{1}{4}$
Wrapping	"	3 7 $\frac{1}{2}$	"	3 7
Check	"	3 8	"	3 7 $\frac{3}{4}$
Leaves	"	3 10	"	3 8 $\frac{1}{2}$

3d and 4th weighing.

WRAPPING	DATE.	WEIGHT. lbs.oz.	DATE	WEIGHT lbs.oz.
Waxed paper	12/18/07	3 9	1/18/08	3 8 $\frac{1}{2}$
Tissue plus waxed	"	3 11 $\frac{3}{4}$	"	3 11 $\frac{1}{4}$
Double waxed	"	4 1 $\frac{3}{4}$	"	4 1
Tissue plus 2 waxed	"	4 2 $\frac{1}{2}$	"	4 2
Tissue	"	3 9 $\frac{1}{4}$	"	3 8 $\frac{1}{2}$
Wrapping	"	3 6 $\frac{1}{2}$	"	3 5 $\frac{3}{4}$
Check	"	3 7	"	3 6 $\frac{1}{4}$
Leaves	"	3 7 $\frac{3}{4}$	"	3 6 $\frac{3}{4}$

This fruit was good at this time. The next table shows the fifth and sixth weighing.

5th and 6th weighing.

WRAPPING	DATE.	WEIGHT lbs.oz.	DATE	WEIGHT lbs.oz.
Waxed paper	2/18/08	3 7 $\frac{3}{4}$	2/18/08	3 7 $\frac{1}{4}$
Tissue plus waxed	"	3 10 $\frac{1}{2}$	"	3 10
Double waxed	"	4 $\frac{1}{2}$	"	4
Tissue plus 2 waxed	"	4 1 $\frac{1}{4}$	"	4 $\frac{3}{4}$
Tissue	"	3 8	"	3 7 $\frac{1}{2}$
Wrapping	"	3 5	"	3 4 $\frac{1}{2}$
Check	"	3 5 $\frac{1}{4}$	"	3 4 $\frac{1}{2}$
Leaves	"	3 6	"	3 5 $\frac{1}{2}$

At this examination I found 20% of the sample that was wrapped in leaves worthless.

7th weighing

Decrease in weight

WRAPPING	DATE.	WEIGHT. lbs.oz.	DECREASE. OZ.
Waxed paper	4/18/08	3 6 $\frac{1}{2}$	4
Tissue plus waxed	"	3 9 $\frac{1}{4}$	4 $\frac{1}{4}$
Double waxed	"	3 15	4 $\frac{1}{2}$
Tissue plus 2 waxed	"	4	4
Tissue	"	3 6 $\frac{1}{4}$	4 $\frac{3}{4}$
Wrapping	"	3 3 $\frac{1}{2}$	4
Check	"	3 3	4
Leaves.	"	3 4	6

With the exception of the sample that was wrapped

in leaves there was very little difference in the amount of shrinkage from the different samples. The sample that was wrapped in leaves, however, decreased nearly two ounces to the pound.

The following table shows the condition this fruit was in when examined the last time.

WRAPPING.	%GOOD	%BAD.
Waxed paper	80	20
Tissue plus waxed	90	10
Double waxed	75	25
Tissue plus 2 waxed	90	10
Tissue	50	50
Wrapping	100	0
Check	30	70
Leaves	0	100

This last variety seemed to be a poor keeper. In January the sample that was wrapped in leaves was beginning to show signs of decay, however, none of it was entirely decayed at that time.

It will also be noticed that the sample that was wrapped in wrapping paper kept better than any of the rest while the sample that was wrapped in leaves all rotted.

CONCLUSIONS

From results of these experiments the following conclusions may be drawn.

1. To keep fruit in a first class condition for any length of time, it is entirely essential that it should be wrapped. The wrapper is beneficial in several ways. (1) The wrapper keeps the decaying spores from passing from one fruit to another. (2) Prevents severe wilting (3) Retains the color of the fruit. (4) Serves as a mechanical protection.

2. From my own observation fruit wrapped in waxed paper will keep longer and in better condition than when wrapped in any other manner.

3. Leaves are inefficient for a fruit wrapper.

5. It is essential that fruit should be kept in a cool place after it is removed from the storage room.

6. Fruit should not be allowed to freeze. decays quicker.

7. Small packages are better than the barrel

8. Fruit should be stored as quick as possible after it is gathered.

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